

INTERVENTIONS FOR
DISASTER VICTIMS:
PRESERVING THE
SOCIAL NETWORK
BY

SUSAN D SOLOMON



2079

C. J. 7-5-92.

INTERVENTIONS FOR DISASTER VICTIMS: PRESERVING THE SOCIAL NETWORK

Susan D. Solomon, Ph.D.

Disaster victims often experience disruption of their social networks. This article discusses the importance of social support networks for disaster victims and the role of social workers in helping them to maintain or rebuild these networks. The author discusses the importance of social support networks for disaster victims and the role of social workers in helping them to maintain or rebuild these networks. The author discusses the importance of social support networks for disaster victims and the role of social workers in helping them to maintain or rebuild these networks.

(Jounal of Social Work, 1998, 38, 444)

Disaster victims often experience disruption of their social networks. This article discusses the importance of social support networks for disaster victims and the role of social workers in helping them to maintain or rebuild these networks. The author discusses the importance of social support networks for disaster victims and the role of social workers in helping them to maintain or rebuild these networks. The author discusses the importance of social support networks for disaster victims and the role of social workers in helping them to maintain or rebuild these networks.

The author would like to thank the following people for their help and support in the preparation of this manuscript:

This paper is a revised version of a paper presented at the National Conference on Disaster Preparedness, Planning, and Response, held in Washington, D.C., in 1996. The author would like to thank the following people for their help and support in the preparation of this manuscript:

This paper is a revised version of a paper presented at the National Conference on Disaster Preparedness, Planning, and Response, held in Washington, D.C., in 1996. The author would like to thank the following people for their help and support in the preparation of this manuscript:

This paper is a revised version of a paper presented at the National Conference on Disaster Preparedness, Planning, and Response, held in Washington, D.C., in 1996. The author would like to thank the following people for their help and support in the preparation of this manuscript:

INTERVENTIONS FOR DISASTER VICTIMS: PRESERVING THE SOCIAL NETWORK

Susan D. Solomon, Ph.D

Most people experienced severe disruptions of their daily routines. Organization activities, conversations, reading, and thinking about Love Canal absorbed their energies. Families who moved in with relatives or to motels exhausted themselves trying to carry on some semblance of their normal routines in unfamiliar settings—some of them unsuitable for daily family living. Some families sorely missed visits from friends and relatives, who were afraid to come into the area. People missed their customary work, hobbies and recreation—the familiar flow and setting of family life. They missed their neighbors and neighborhood acquaintances—the comforting sense of familiar faces in familiar places.

(Levine, 1966, p. 185)

Any major disaster carries with it the potential for interfering with the normal functioning of social support networks. Disasters may disrupt social networks in either of two basic ways: through the actual death of a primary group member, or through disruptions caused by responses to disaster. Such responses include evacuation, breakdowns in transportation, failure of communication systems, and temporary or permanent relocation (Bolin, 1984). Not only are ties with family and friends affected, but also social ties with the locale. For example, social activities involving voluntary associations, churches, and recreational groups may be jeopardized by the relocation of families and/or the destruction of physical facilities where various activities have been held (Trainer & Bolin, 1976). Ironically, these disruptions of social networks occur at a time when the need for social support is particularly high, since the disaster victim typically experiences many stressful life events at the same

The author would like to thank Dr. Emeline Otey for her helpful comments on an earlier draft of this manuscript.

This paper was excerpted from the chapter "Mobilizing Social Support Networks in Times of Disaster," in Figley, C.R. (Ed.) (1986). *Trauma and Its Wake, Volume II: Post-Traumatic Stress Disorder: Theory, Research, and Treatment*. New York: Brunner/Mazel, pp. 232-263.

Address correspondence to Susan D. Solomon, Ph.D., National Institute of Mental Health, 5600 Fishers Lane, Room 10C-09, Rockville, MD 20857.

02079

OH100

COMMUNITY HEALTH CELL
326, V Main, I Block
Koramangala
Bangalore-560034
India

time (e.g., disability or death of a family member, material losses, uncomfortable and unfamiliar surroundings, job loss) (Garrison, 1983).

Although social support has been defined in many ways, most definitions include the following four components: emotional support, reciprocity of obligation, task-oriented assistance, and provision of information relevant to coping (Mitchell & Trickett, 1980). The first component, emotional support, may include providing information that one is loved, cared for, and respected (Cobb, 1976), and/or providing the opportunity to express one's feelings and beliefs (Lowenthal & Haven, 1968; Wortman & Dunkel-Schetter, 1979). The second kind of support, reciprocity of obligation, involves providing information that one is part of a network or support system of reciprocal help and mutual obligation (Cobb, 1976; Kahn & Antonucci, 1980). Finally, the fourth component of support, coping-related information, may be conveyed by providing feedback about the appropriateness of one's fears, beliefs, and opinions (Kahn & Antonucci, 1980; Wortman & Dunkel-Schetter, 1979). (For a more detailed discussion of the construct of social support, see Caplan, 1974; Cobb, 1976; Heller, 1979; Mitchell & Trickett, 1980; Wallston et al., 1983).

Researchers in this area recognize the need for distinguishing between the concepts of social support and social network (Schaefer et al., 1981). While the former concept tends to be operationalized qualitatively, as in the above definition, the latter is typically operationalized quantitatively, in terms of such factors as the number of relationships one has, the frequency of contact with specific types of others, and the number of linkages between network members (Wallston et al., 1983). The social network may be viewed as the context within which social support functions (Lieberman, 1982); it refers to the individual's personal community of associates with whom s/he interacts on a face-to-face basis (Gottlieb, 1976). More specifically, the social network consists of "a person's relationships with relatives, friends, neighbors, co-workers, and other acquaintances who interact with the person" (Unger & Powell, 1980, p. 566).

This paper examines ways in which mental health professionals can intervene in the personal network to preserve and enhance social support in times of emergency. Consideration of the support network is important in planning effective policy, outreach, and service efforts, both prior to and following the development of an emergency.

PREDISASTER PREPARATION

Some of the negative psychological impacts of disaster can be ameliorated by adequate federal, state, and local preparedness planning in advance of the emergency (Zarle et al., 1974). Level of preparedness refers both to planning for the management of disaster impact and to planning for aftermath reconstruction (Perry & Mushkatel, 1983). The level and type of preparedness planning affects the extent to which social supports remain intact following a disaster.

Policy

Policymakers should be encouraged to attend to social network factors in planning for emergencies. Particular care should be given to preserving existing

social support systems. The importance of doing so is suggested by the findings of a study that attempted to assess the long-term consequences of a flash flood through the analysis of public records (Hall & Landreth, 1975). Only a small segment of the population was found to be exhibiting indications of social stress; however, the authors believed that the Federal Disaster Relief Program, more than the flood itself, had greater impact on social dysfunction.

One important area for policymakers to consider in their planning efforts is relocation. Relocation efforts should include the attempt to retain the natural social groupings of the evacuees (Church, 1973). Disaster victims are often settled in temporary housing located away from both the impact zone and established transportation systems (e.g., Davis, 1977). The use of trailers for such housing may be particularly stressful if the trailers are located in camps specifically constructed for disaster victims (Bolin, 1984). Because trailers are typically assigned on a first-come-first-served basis, these temporary camps do not reflect the social patterns of the neighborhoods from which victims come (Gleser et al., 1981). Planners should consider other methods of housing assignment that take into account existing support networks, and attempt to select locations with easy access to functioning public transportation. When permanent relocation is necessary and separation from previous support networks is unavoidable, victims should be guided toward housing designed so that dwellings and walkways maximize opportunities for the formation of new friendships (see Gottlieb, 1976).

Also worthy of policy attention is the importance of adequate communication during the emergency period. The level of community preparedness is positively associated with the likelihood that citizens will receive sufficient warning of an anticipated disaster (Perry & Mushkatel, 1983). Furthermore, breakdown in communication during the emergency period (one to three days after impact) may be very stressful for victims unable to locate family members or ascertain the well-being of kin, friends, and neighbors (Bolin, 1984).

Since immediate restoration of telephone service may be difficult in some disaster situations, Bolin suggests establishing alternative methods of communication, such as clearinghouses where affected residents can register and exchange information regarding whereabouts, health status, etc. Availability of effective communication may be of particular importance to emergency workers, who need information about the scope of the impact and reassurance of the safety of family members in order to effectively perform their jobs (Form & Rosow, 1958).

Social policies that emphasize hospital- or clinic-based rather than home-based mental and physical health services should be recognized as disruptive of existing family and social ties. Suggestive in this regard are study findings indicating that acute heart attack victims randomly assigned by their physicians to home care versus hospital care did not differ in mortality, despite the hospital groups' easier access to emergency equipment and trained personnel (Mather et al., 1971). Bolin (1982) reports that several respondents in his study of Texas tornado victims had to commute over 50 miles to visit hospitalized family members. The need to travel extensively for several weeks impaired the victims' ability to rebuild their homes and obtain aid, and thus added considerably to the stress and disruptiveness of having a family member injured.

More policy attention should also be given to the issue of transportation. Long-term disruption of transportation systems can create difficulties in accessing social support networks (Trainer & Bolin, 1976). Relocation to temporary housing out of the reach of functioning transportation systems can also have this effect (see earlier discussion). Current social policies governing third-party reimbursement for transportation may permit access to a minibus for health purposes, but are likely to exclude its use for social purposes (Snow & Gordon, 1980). It is important that disaster victims have access not only to relief agencies but to members of their social network as well, since it has been shown that individuals unable to use many sources of transportation tend to be among those least able to meet their needs for social interaction (Evans, 1979). Particularly vulnerable in this regard are the elderly and the disabled, for whom transportation poses a problem even without the disruptive effect of disaster.

Outreach

Effective social support mobilization requires an extensive program of outreach and education. Optimally, the bulk of these efforts will occur *prior* to the emergency, as part of a community's preparedness planning. In order for people to be able quickly to mobilize assistance following a traumatic event, they need to have done so in noncrisis situations.

One community model for mobilizing mental health resources is that of the "neighborhood service center" (Riessman, 1967). When such a service program is already in place and meeting community needs in times of nonemergency, the resources for social support are readily available to victims of trauma when disaster does occur. As described by Riessman (1967), the neighborhood service center is staffed largely by indigenous nonprofessionals from the local area, working under the supervision of a professional mental health specialist. Aimed at preventive intervention, one of the goals of such a program is to provide and expedite services relevant to mental health, with an emphasis on outreach and group services that foster the self-help and mutual obligation characteristic of true social support. A second interrelated goal is to increase social cohesion by developing various types of groups oriented toward meeting community needs. Once so organized, the center is ideally positioned to educate neighborhood residents in the basics of preparedness planning, and to assist them in organizing support networks for both predisaster planning and post-disaster coping.

Riessman (1976) suggests that outreach to the local population is most successfully accomplished by recruiting nonprofessionals directly from the neighborhoods the agency is attempting to serve (see also Heller, 1979; Reiff, 1967; Silverman, 1976). These paid nonprofessionals may be in a position to accomplish social support functions that the professionals cannot, such as establishing a peer relationship and empathizing with the victim's style of life (Reiff & Riessman, 1965). The indigenous nonprofessional workers are encouraged to play the role of the friendly neighbor who listens sympathetically and provides emotional support (Riessman, 1967). This role is of particular

value in working with disaster victims, who are known to shun services labeled "mental health" because of the associated stigma. The indigenous nonprofessional not only discovers and/or educates the citizenry about community needs, but also serves as a social model of active participation, influencing other reference group members in the direction of preventive mental health practices and community preparedness planning (cf. Green, 1970). The indigenous worker is also in a position to identify local key activists and opinion leaders so that their support may be enlisted in mobilizing the community for preparedness planning (see Gottlieb, 1976).

In addition to the use of local nonprofessionals, another method of outreach to social support networks is by means of the local media. In their predisaster planning efforts, communities should develop and distribute public service messages that stress family preparedness for possible disasters, with instructions on how to prepare for both physical and psychological survival of such events (Smith, 1983). Similarly, professional newsletters provide a medium for encouraging businesses to develop disaster plans that train employees in their respective areas of responsibility in the event of different types of emergencies (e.g., Red Cross Disaster Resource Center, 1982).

POSTDISASTER ACTIVITIES

Although adequate planning in advance of the emergency is extremely important for subsequent psychological recovery, too often communities find themselves unprepared when disaster strikes (e.g., Zarle et al., 1974). Regardless of how much or how little advance planning has taken place, there are a number of ways in which social support systems may be fostered and utilized to enhance recovery in the aftermath of disaster.

Outreach

After disaster strikes a community, informal social networks can be used to disseminate information about an agency and to generate referrals. Indigenous paraprofessionals may be recruited for postdisaster casefinding (Bowman, 1975; Duffy, 1978; Zarle et al., 1974). The efficacy of these indigenous workers stems in part from their status as reference group members who transmit norms sanctioning the use of professional services. This is especially important because experiencing obvious psychological or physical disaster aftereffects may not in itself be sufficient for victims to seek professional help; they must also perceive the symptoms as interfering with effective functioning, and they must perceive help-seeking as sanctioned by their support group (Zola, 1973; see also Lieberman, 1982; Wallston et al., 1983).

With or without the assistance of indigenous nonprofessionals, mental health professional staff can enhance the effectiveness of their outreach efforts by the use of network analysis (Llamas et al., 1981; McCallister & Fischer, 1978). Staff should be encouraged to develop skills in helping individuals to establish and maintain networks, as well as in the art of linking individuals with community resources (Mitchell & Trickett, 1980). The latter may involve conducting a preliminary needs and resource assessment of the community.

to identify problem areas and high-risk groups. Both paid staff and volunteer service workers should be trained to use an information and referral system, in which a directory of available social services is compiled and used to make appropriate referrals (e.g., Mathews & Fawcett, 1979).

Because social networks serve as major sources of information about and referral to professional services, informal community caregivers and neighborhood leaders can be identified and used to publicize mental health programs. For example, a disaster might affect a neighborhood of low-income elderly who are relatively isolated and unaware of existing formal resources. If network analysis suggested frequent church attendance, the clergy could be used as a source for disseminating information about the available mental health programs (Mitchell & Trickett, 1980). Along these lines, Leutz (1976) found that providing information about formal resources to informal caregivers (such as clergy, bartenders, and merchants) increased the number of referrals made by these individuals to social service agencies.

For networking strategies to be effective, program staff must learn to identify network leaders and provide them with 1) consultation for the psychological and health problems that come before them, 2) information about existing community resources, and 3) backup services for problems beyond the capacity of the informal support system (Cohen & Sokolovsky, 1979).

As a final approach to outreach, social support networks can be effectively activated through public service announcements by the media. Newspaper, radio, and television personnel should be educated to go beyond fragmented dramatization of a disaster event, to the role of activating citizenry toward creation of support resources for themselves, as well as of helping victims to identify existing formal resources and available options for rebuilding their community. A good example of this approach is the effort undertaken by the Greater Kansas City Mental Health Information Network following the skywalk collapse of the Kansas City Hyatt Regency Hotel in 1981, a major tragedy in which 114 individuals were killed and over 200 others injured (see Hartsough, 1983). The Network immediately formulated a campaign to provide a coordinated flow of therapeutic messages and information to the local media. Four aspects were consistently stressed: 1) certain distressing reactions are to be expected following a disaster; 2) these are normal responses to an abnormal event; 3) it is important for one's well-being to be accepting of one's own as well as other's feelings, and to share one's feelings with others; and 4) help is available.

Services

Postdisaster mobilization of the support network is important not only in outreach but in service intervention as well. The mental health problems experienced by disaster victims tend not to be psychoses but rather stress-induced symptoms precipitated by countless practical problems victims encounter in the aftermath (Smith, 1983). Practitioners advocate that victims be viewed as normal individuals temporarily disrupted by severe stress (Farberow, 1978). Major goals of mental health disaster intervention include restoring the ability of victims to handle the stresses they experience, and

assisting victims in reordering their world through social interaction (Cohen & Ahearn, 1980). Disaster victims need both emotional support and material support in this time of crisis; the mental health worker's role is to facilitate victims' contacts with formal and informal support networks to ensure that both kinds of needs are met. Although assistance efforts may include providing concrete types of help for normal problems of living (Farberow, 1978; Riessman, 1967), too much dependency should be discouraged (Cohen & Ahearn, 1980). Instead, the chief aim should be to foster self-sufficiency by helping victims develop their own resources for recovery (Smith, 1983). Among the most important resources available to the victim is the social support network. Because existing social ties may be disrupted by disaster, an important goal for the mental health professional working with victims is to assist in strengthening these ties and building new ones.

Since kinship bonds may be strained, services should be oriented toward fortifying these relationships. Victims need the opportunity to describe their traumatic experiences, often repeatedly (Figley, 1979). They need an opportunity to ventilate their feelings of anger, guilt, and loss (Grossman, 1973). Some victims may experience emotional, psychosomatic, or behavioral problems following impact (Gleser et al., 1981). Smith (1983) suggests that families who are able to accept and encourage these responses and who foster the quick resumption of normal roles and patterns will speed victims' coping processes. When families are unable to provide an effective stress-buffering environment, professional intervention is needed.

Intervention programs most effectively facilitate recovery when services are planned around the victim's natural support system. Professionals and nonprofessionals alike should be trained in the need to deal with families as units, and in the importance of keeping kin together whenever possible so that family support systems remain intact (Smith, 1983). When a client presents a problem, the mental health professional must first determine whether the difficulty can be handled by the client's existing support system. Family members as well as neighbors and friends may then be contacted and encouraged to increase their participation in the problem, voice their concerns, and implement solutions (Unger & Powell, 1980). Since disaster has a traumatic impact on the whole family, therapy might best be provided to the entire family unit, rather than only to the troubled individual (Smith, 1983).

The mental health professional can show families how to provide a supportive environment for their own members by offering a model of empathic listening, concern, and acceptance, as well as an approach for defining problems and establishing recovery priorities. Professionals assist the family in restoring the normal interactions that children need in order to reestablish a sense of security and familiarity (Blaufarb & Levine, 1972). Since parents often find it difficult to give their children the extra attention they need while also taking care of urgent recovery activities, the mental health worker can suggest ways of involving the children in restoration activities (Smith, 1983). She can also direct parents toward available day-care services, one of the most salient needs of parents abruptly faced with a search for new living quarters and other immediate tasks (Levine, 1983; Peuler, 1984).

Nonkinship ties are also important sources of support for service providers

to foster. One approach is to direct efforts toward strengthening existing networks that have been disrupted by disaster. Along these lines, Smith (1983) recommends encouraging families to keep active their ties with their neighbors and friends, perhaps by establishing a teamwork approach to postdisaster chores. Families should also be encouraged to devote time to purely recreational activities that maintain social contact with their support network.

It should also be recognized that existing social networks have negative as well as positive effects. For example, a recent study of victims exposed to flooding and/or dioxin contamination found that males and females differed in their response to disaster exposure. Although males showed elevated symptoms of alcohol abuse and depression as a direct result of disaster exposure, female victims' symptomatology was unaffected unless exposure was also accompanied by heavy demands for support from network members. Although excellent spouse support attenuated male symptomatology, its presence was associated with an exacerbation of symptoms in female victims (Solomon et al., in press). The results of this research suggest the possibility that some social networks may be so demanding that their female members may benefit emotionally from isolation from their network members, rather than from closer integration (Cohler & Lieberman, 1980). It is possible that both sexes may benefit from having their social needs redirected away from the immediate network, and toward mutual help groups with other disaster victims who share similar experiences and problems.

As an alternative to attempting to preserve existing bonds, mental health professionals may elect to direct their efforts toward facilitating the construction of *new* social support networks for the disaster victim. In this regard, the service agency might foster the development of an active mutual aid system among clients sharing similar problems in coping with the effects of exposure to disaster. Lieberman (1982) makes a distinction between informal social resources and the type of resources provided by a self-help group (see also Gottlieb, 1976). Lieberman (1982) describes self-help groups as "highly bounded systems, requiring more formal and specified exchange than is ordinary in kith or kin relationships [S]elf-help groups . . . provide social linkages to relevant networks of people who can become friends and confidants" (p. 765).

Mental health professionals are in a position to assist in the establishment of this kind of new support system for disaster victims. Attempts have been made to do so in a number of different disasters, with varying degrees of success (e.g., Grossman, 1973; Hartsough, 1983; Peuler, 1984). For example, Grossman (1973) describes a series of support groups composed of survivors, relatives, and staff members which were organized following a Chicago train wreck. Although attendance was poor, the survivors who did attend considered the sessions to be a vital part of their recovery, since they felt that the lasting effects of their trauma could be fully understood only by those who had shared the experience. Practitioners have made several recommendations for maximizing the success of such disaster support groups: leadership by a nonprofessional mental health aide (Riessman, 1967); short-term, topic-oriented discussions (Levin et al., 1980); sessions tailored to subgroups of victims with common problems (e.g., parent groups, women's groups) (Levin et al., 1980); and sessions

held within the community rather than within the (stigmatizing) mental health facility (Farberow, 1978; Hartsough, 1983; Peuler, 1984).

Among the individuals most in need of the help offered by a support group are the disaster relief workers (Cohen & Ahearn, 1980; Dunning & Silva, 1980; Hartsough, 1983; Mitchell, 1982; Peuler, 1984). Dunning and Silva (1980) suggest that rescue organizations should implement stress-debriefing programs that provide for the prevention of stress symptoms through early detection and treatment. These programs require organizational prior commitment and immediate action (24–48 hours) following disaster to provide information and encourage communication among workers. In these sessions, emergency workers should be trained to offer emotional support to one another, by discouraging unrealistic self-expectations, by acceptance and understanding of other's on-scene or delayed stress responses, and by demonstrating appreciation for the supportive efforts of fellow workers (Mitchell, 1982). Mitchell suggests that, while an operations critique of the disaster may be needed for improved performance, it should take place separately from the stress-debriefing session. A policy of mandatory (but nonpunitive) attendance of these sessions may be useful in overcoming workers' reluctance to seek help (Hartsough, 1983), in that it reduces the stigma associated with seeking mental health care. However, the rescue organization should also assume responsibility for encouraging workers to seek therapy for more severe manifestations of disaster trauma (Dunning & Silva, 1980). Worker support groups that include family members may also be of benefit, since families need to be aware of behavioral disturbances caused by the traumatic experience and may feel cut off when workers' reactions are not shared with them.

SUMMARY

Adequate preparedness planning can do much to alleviate the trauma experienced by disaster victims. Policymakers should consider ways in which existing social support systems can best be preserved in planning for relocation, communication, health care, and transportation needs following disaster. Communities best prepared for disaster are those whose mental health needs are being successfully met in noncrisis situations. A neighborhood service center staffed with indigenous nonprofessionals may reach those who would otherwise avoid association with a mental health facility; ongoing support groups may be started by this center and encouraged to include disaster preparedness planning in their community problem-solving efforts. Media public service announcements and business newsletters should include messages that stress the importance of family and organizational disaster preparedness planning.

Much can also be done in the aftermath of disaster to strengthen social support systems. Mental health professionals need to be trained to conduct a network analysis of their communities. Indigenous nonprofessional workers and community gatekeepers should be trained to detect the psychological effects of disaster exposure and to refer individuals with problems to the mental health agency. Media should be encouraged to educate the citizenry in how to maximize their social resources and access formal resources after disaster strikes. Service interventions should be oriented toward strengthening existing

kith-and-kin ties, and/or toward developing new sources of social support. Self-help groups for both victims and rescue workers may do much to relieve the emotional burdens experienced by those exposed to the trauma of disaster.

REFERENCES

- Blaufarb, H., & Levine, J. (1972). Crisis intervention in an earthquake. *Social Work*, 17, 16-19.
- Bolin, R. (1984, March). Community disruption and psychosocial impacts. Working paper for National Institute of Mental Health Workshop, Mental Health Needs Assessment Following Disaster, Bethesda, MD.
- Bowman, S. (1975, August). Disaster intervention from the inside. Paper presented at the annual meeting of the American Psychological Association, Chicago, IL.
- Caplan, G. (1974). *Support systems and community mental health: Lectures on concept development*. New York: Behavior Publications.
- Church, J. (1973, August). The Buffalo Creek disaster: Extent and range of emotional and/or behavioral problems. Presented at Picking up the Pieces: Disaster Intervention and Human Ecology, Symposium at the annual meeting of the American Psychological Association, Montreal, Canada.
- Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, 38, 300-314.
- Cohler, B., & Lieberman, M. (1980). Social relations and mental health among three European ethnic groups. *Research on Aging*, 2, 445-469.
- Cohen, C.I., & Sokolovsky, J. (1979). Clinical use of network analysis for psychiatric and aged populations. *Community Mental Health Journal*, 15(3), 203-213.
- Cohen, R.E., & Ahearn, F.L. (1980). *Handbook for mental health care of disaster victims*. Baltimore: The Johns Hopkins University Press.
- Davis, I. (1977). Emergency shelter. *Disasters*, 1(1), 23-40.
- Duffy, J.C. (1978). Emergency mental health services during and after a major aircraft accident. *Disasters*, 2(213), 159-162.
- Dunning, C., & Silva, M. (1980). Disaster-induced trauma in rescue workers. *Victimology: An International Journal*, 5(2-4), 287-297.
- Evans, L.K. (1979). The relationship of need awareness, locus of control, health state, and social support system to social interaction as a form of self-care behavior among elderly residents of public housing. Unpublished doctoral dissertation.
- Farberow, N. L. (1978). *Training manual for human service workers in major disasters*. Rockville, MD: National Institute of Mental Health.
- Figley, C. R. (1979, May). Combat as disaster: Treating combat veterans as survivors. Invited presentation at the annual meeting of the American Psychiatric Association, Chicago, IL.
- Form, W. H., & Rosow, S. (1958). *Community in disaster*. New York: Harper.
- Garrison, J. (1983). Mental health issues in relocation. Unpublished manuscript. National Institutes of Mental Health.
- Gleser, G. C., Green, B. L., & Winget, C. (1981). *Prolonged psychosocial effects of disaster: A study of Buffalo Creek*. New York: Academic Press.
- Gottlieb, B. H. (1976). Lay influences on the utilization and provision of health services: A review. *Canadian Psychological Review*, 17(2), 126-136.
- Green, L. W. (1970). Should health education abandon attitude change strategies? Perspectives from recent research. *Health Education Monographs*, 30, 25-48.
- Grossman, L. (1973). Train crash: Social work and disaster services. *Social Work*, 18(5), 38-44.
- Hall, P. S., & Landreth, P. W. (1975). Assessing some long-term consequences of a natural disaster. *Mass Emergencies*, 1, 55-61.
- Hartsough, D. (1983). Mitigating the emotional consequences of disaster work. A guide for training and debriefing. Unpublished manuscript. Purdue University.
- Heller, K. (1979). The effects of social support: Prevention and treatment implications. In A. P. Goldstein & F. H. Kanfer (Eds.), *Maximizing treatment gains. Transfer enhancement in psychotherapy*. New York: Academic Press.
- Kahn, R. L., & Antonucci, T. (1980). Convoys over the life course: Attachment roles and social support. In P. B. Baltes & O. Brim (Eds.), *Life-span development and behavior* (Vol. 3). Boston: Lexington.

- Leutz, W. N. (1976). The informal community caregiver: A link between the health care system and local residents. *American Journal of Orthopsychiatry*, 46, 678-688.
- Levin, S. S., Groves, A. C., & Lurie, J. D. (1980). Sharing the move—Support groups for relocated women. *Social Work*, 25(4), 323-325.
- Levine, A. G. (1983). *Love Canal: Science, politics and people*. Lexington, MA: Lexington Books.
- Lewis, C. E. (1966). Factors influencing the return to work of men with congestive heart failure. *Journal of Chronic Diseases*, 19, 1193-1209.
- Lieberman, M. A. (1982). The effects of social supports on responses to stress. In L. Goldberger, & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects*. New York: Free Press.
- Llamas, R., Pattison, E. M., & Hurd, G. S. (1981). Social networks: A link between psychiatric epidemiology and community mental health. *International Journal of Family Therapy*, 3, 180-193.
- Lowenthal, M., & Haven, C. (1968). Interaction and adaptation: Intimacy as a critical variance. *American Sociological Review*, 33, 20-30.
- Mather, H. G., Pearson, N. G., Read, K. L. Q., Shaw, D. B., Steed, G. R., Thorne, M. G., Jones, S., Guerrier, C. J., Eraut, C. D., McHugh, P. M., Chorodbury, N. R., Jafary, M. H., & Wallace, T. J. (1971). Acute myocardial infarction: Home and hospital treatment. *British Medical Journal*, 3, 334-338.
- Mathews, R. M., & Fawcett, S. B. (1979). Community information systems: Analysis of an agency referral program. *Journal of Community Psychology*, 7, 281-289.
- McCallister, L., & Fischer, C. S. (1978). A procedure for surveying personal networks. *Sociological Methods and Research*, 7, 131-148.
- Mitchell, J. T. (1982, Fall). Recovery from rescue. *Response Magazine*, 7-10.
- Mitchell, R. E., & Trickett, E. J. (1980). Task force report: Social networks as mediators of social support: An analysis of the effects and determinants of social networks. *Community Mental Health Journal*, 16, 27-44.
- Perry, R. W., & Mushkatel, A. H. (1983). *Psychosocial consequences of emergencies in the natural environment: The case of volcanic eruptions*. Unpublished manuscript. Arizona State University.
- Peuler, J. (1984, May). Innovations in family and community outreach in times of disaster. Paper presented at the National Institute of Mental Health symposium. Innovations in Mental Health Care of Victims. Washington, DC.
- Red Cross Disaster Resource Center (1982). *San Francisco corporate disaster plan*. San Francisco: Red Cross.
- Reiff, R. (1967). Mental health manpower and institutional charge. In E. L. Cowen, E. A. Gardner, & M. Zax (Eds.), *Emergent approaches to mental health problems*. New York: Appleton-Century-Crofts.
- Reiff, R., & Riessman, F. (1965). The indigenous nonprofessional. *Community Mental Health Journal*, Monograph No. 1.
- Riessman, F. (1967). A neighborhood-based mental health approach. In E. L. Cowen, E. A. Gardner, & M. Zax (Eds.), *Emergent approaches to mental health problems*. New York: Appleton-Century-Crofts.
- Schaefer, C., Coyne, J. C., & Lazarus, R. S. (1981). The health-related functions of social support. *Journal of Behavioral Medicine*, 4(4), 381-406.
- Silverman, P. R. (1976). The widow as caregiver in a problem of preventive intervention with other widows. In G. Caplan & M. Killilea (Eds.), *Support systems and mutual help: Multidisciplinary explorations*. New York: Grune & Stratton.
- Smith, S. M. (1983). Disaster: Family disruption in the wake of disaster. In C. R. Figley & H. I. McCubbin (Eds.), *Stress and the family, Volume II. Coping with catastrophe*. New York: Brunner/Mazel.
- Snow, D. L., & Gordon, J. B. (1980). Social network analysis and intervention with the elderly. *Gerontologist*, 20(4), 463-467.
- Solomon, S. D., Smith, E. M., Robins, L. N., & Fischbach, R. L. (in press). Social involvement as a mediator of disaster-induced stress. *Journal of Applied Social Psychology*.
- Trainer, P., & Bohm, R. (1976). Persistent effects of disasters on daily activities: A cross-cultural comparison. *Mass Emergencies*, 1, 279-290.
- Unger, D. G., & Powell, D. G. (1980). Supporting families under stress: The role of social networks. *Family Relations*, 29, 566-574.
- Wallston, B. S., Alagna, S. W., DeVellis, B. M., & DeVellis, R. F. (1983). Social support and physical health. *Health Psychology*, 2(4), 367-391.
- Wortman, C. B., & Dunkel-Schetter, C. (1979, May). Dilemmas of social support. Par-

- allels between victimization and aging. Paper presented at National Research Council Committee on Aging Workshop, The Future of the Elderly, Annapolis, MD.
- Zarle, T. H., Hartsough, D. M., & Ottinger, D. R. (1974). Tornado recovery: The development of a professional-paraprofessional response to a disaster. *Journal of Community Psychology*, 2(4), 311-320.
- Zola, I. K. (1973). Pathways to the doctor—From person to patient. *Social Science and Medicine*, 7, 677-689.

In press, Comprehensive Psychiatry

DSM-III-R Criteria for PTSD

Appropriateness of DSM-III-R Criteria for Post-traumatic Stress Disorder

Susan D. Solomon, Ph.D.

Division of Clinical Research

National Institute of Mental Health

Glorisa J. Canino, Ph.D.

Mental Health Secretariat &

Department of Psychiatry

University of Puerto Rico

Running Head: Appropriateness of DSM-III-R Criteria for PTSD

Author Notes

This paper will be presented at the 5th Annual Meeting of the Society for Traumatic Stress Studies, San Francisco, California, October, 1989.

This research was partially supported by a supplement to the Epidemiological Catchment Area Program (ECA) Cooperative Agreement U01 MH 33883 awarded to Principal Investigators Lee N. Robins and John E. Helzer of Washington University in St. Louis, for research performed with NIMH Principal Collaborators Darrel A. Regier, Ben Z. Locke, and Jack D. Burke, Jr.; the NIMH Project Officer was William Huber. It was also supported by a supplement to Grant R01 MH36230 awarded to Principal Investigator Glorisa J. Canino. The opinions or assertions contained herein are the private ones of the authors, and are not to be considered as official or reflect the views of the National Institute of Mental Health or the Mental Health Secretariat.

The authors gratefully acknowledge the invaluable contributions of Elizabeth M. Smith, Lee N. Robins, Milagros Bravo, and Maritza Rubio-Stipec throughout the development of the overall projects, as well as the helpful comments of Naomi Breslau, Charles Kaelber, Ben Locke, and Lee Robins on an earlier draft of this paper.

Requests for reprints should be sent to Susan D. Solomon, Division of Clinical Research, National Institute of Mental Health, Room 10C-05, 5600 Fishers Lane, Rockville, Maryland 20857.

Abstract

This research examines the DSM-III-R criteria for post-traumatic stress disorder (PTSD). The study questions whether the psychiatric sequelae resulting from exposure to extraordinary traumatic events (stressor Criterion A) do in fact differ from the sequelae resulting from exposure to more common yet stressful life experiences. The study also examines whether PTSD sequelae (Criteria B-D) accurately describe the responses of victims even of extreme events fitting the DSM-III-R definition of stressor. The study included data from both St. Louis victims exposed to floods and/or unsafe dioxin levels, and Puerto Rico victims of mudslides/flooding. Results showed that some of the common stressful events related more closely to PTSD symptoms than did the extraordinary events. Further, disaster exposure most strongly related to symptoms of reexperiencing (Criterion B); symptoms relating to avoidance (Criterion C) were particularly unreported. Results are discussed in terms of their implications for revision both of the PTSD criteria for DSM-IV, and of instruments designed to assess PTSD symptomatology.

Appropriateness of DSM-III-R Criteria for Post-traumatic Stress Disorder

The diagnosis of post-traumatic stress disorder was first officially recognized in the third edition of the Diagnostic and Statistical Manual (DSM-III) (1), and was revised in 1987 for DSM-III-R (2). The DSM-III-R criteria for PTSD retain several controversial aspects. Currently underway are efforts to refine these criteria for DSM-IV. This research is designed to help provide an empirical basis for decisions relating to the appropriateness of the criteria as presently defined.

To meet criteria for the diagnosis as defined in DSM-III-R, an individual must have "experienced an event that is outside the range of usual human experience" (Criterion A). Symptoms which are posited to result from this exposure cluster into three distinct types: 1) four symptoms relating to reexperiencing the trauma (Criterion B), such as intrusive distressing recollections or recurrent dreams; 2) seven symptoms relating to avoidance of stimuli associated with the trauma or numbing of general responsiveness (Criterion C), such as avoidance of trauma-related thoughts, or diminished interest in people or activities; and, 3) six symptoms of persistent increased arousal (Criterion D), such as difficulty in sleeping or concentrating. To qualify for the diagnosis of PTSD, an individual must present at least one reexperiencing, at least three avoidance, and at least two arousal symptoms.

This paper examines the appropriateness of these criteria as both discriminators between disaster victims and non-victims (the stressor criterion), as well as accurate descriptors of the responses of victims of disasters in St. Louis and Puerto Rico (the symptomatology criteria). With respect to the stressor criterion, the present study questions whether

the psychiatric sequelae resulting from exposure to traumatic events "outside the range of usual human experience" (e.g., dioxin contamination, floods, being mugged/beaten) do in fact differ from the sequelae resulting from exposure to more common yet stressful life experiences (e.g., money problems, family illness, burglary, bereavement, separation). While this conceptual issue has been raised by other investigators (3-4), this study is the first to our knowledge to empirically examine the PTSD sequelae of environmental stressors that include both ordinary and extraordinary events.

The other important issue addressed by this research is whether PTSD symptomatology (Criteria B-D) accurately describe the responses of victims even of extreme events fitting the DSM-III-R definition of stressor (in this case, disaster). Since DSM-III-R was written, several traumatic stress studies have been conducted. Most studies which assess PTSD report their results either terms of rates of full-blown diagnosis, or else in terms of undefined "partial" or "subclinical" levels. However, we noted that four studies were more specific about the types of symptoms reported by victims, and that these studies obtained a similar pattern of results: victims are reporting primarily the re-experiencing (B Criteria) kinds of symptoms (unpublished paper of W. True, 5-7). Despite victims' apparently high levels of distress following exposure to traumatic events, symptoms particularly of avoidance/numbing (Criterion C) but also of arousal (Criterion D) were reported much less often. To date this observation has been supported largely by clinical impression of a range of severely traumatized populations, including Vietnam veterans, Lebanese terrorism victims, and Cambodian refugees (undocumented personal communication with

J. Fairbank; E. Karam; R. Mollica). However, if confirmed through rigorous test, it would suggest that highly traumatized disaster victims may be going undiagnosed as PTSD cases. The present paper is designed to provide a systematic test of the pattern of symptomatology expressed by victims of a range of disasters.

If the present results are found to confirm those suggested by the work of others, the problem then becomes one of interpretation. Infrequent reporting of avoidance and arousal symptoms could be because disaster victims' symptom patterns do not fit the criteria as currently written. Alternatively, the criteria may be perfectly appropriate for characterizing the responses of disaster victims, but the measures commonly used to assess avoidance and arousal symptoms may be flawed. These two interpretations are explored in the present study.

Using data from independent studies of first, victims of dioxin and flooding in St. Louis, and second, victims of flooding and mudslides in Puerto Rico, this study systematically examines the patterns of sub-clinical symptomatology resulting from exposure to different kinds of disaster, to assess whether victims display sequelae which are similar across disaster events but different from the current criteria for PTSD. Further analyses address whether such a result, if found, could be an artifact of the way these symptoms are assessed.

The Disasters

Two distinct datasets were analyzed for this study, drawing from very different samples of disaster victims.

St. Louis. The first dataset contained the responses of rural St. Louis area victims exposed to flooding and/or dioxin contamination during the

winter of 1982 (8). The flood, one of Missouri's worst, was responsible for five deaths and forced approximately 25,000 people to be temporarily evacuated, thousands of whom remained homeless. One flooded community, Times Beach, faced an additional ordeal. Three weeks after the flood, the Environmental Protection Agency (EPA) determined that dioxin levels in Times Beach were 300 times higher than the level identified by the National Centers for Disease Control (CDC) as a potential health risk. Fearing that the flood had swept dioxin-laden sediment into homes, the federal government bought out the town, forcing residents to scatter widely to various unwelcoming communities. Times Beach was only one of many Missouri sites subsequently found to have unsafe levels of dioxin. However, only Times Beach was offered a federal buyout.

Puerto Rico. The disaster that prompted the Puerto Rican study was objectively more severe than those which took place in St. Louis. In October of 1985, Puerto Rico experienced 3 days of torrential rain in the wake of a stationary tropical wave. The island experienced extensive flooding and deadly mudslides which resulted in 180 deaths, over 4,000 homeless, and approximately 19,000 suffering substantial material losses. In contrast to the St. Louis disasters, the Puerto Rican flood was not only highly disruptive, but also immediately life threatening to a substantial number of its victims. Of the exposed individuals included in this study, half had either a family member, friend, or neighbor who died or was in danger of dying due to the disaster, and half of the exposed also had to be relocated. Forty six percent felt that the lives of their immediate family members were threatened by the disaster.

Method

Samples

By chance these disasters took place just after both Washington University and the University of Puerto Rico had finished interviews in a major epidemiological program designed to assess the psychiatric status of each of these regions (9). Although these studies were conducted independently of one another, and at different time periods, they followed similar procedures. Each site recontacted all of the original respondents living in the disaster-affected area, as well as a randomly selected control group of original respondents presumed to be outside the area of impact. Both sites also included comparison groups that had not been previously interviewed: one selected for its disaster exposure, and the other for the lack of it. The St. Louis site interviewed a total of 543 individuals in the post-disaster wave of data collection, of whom 452 had been interviewed prior to the disaster. The Puerto Rico site completed 912 post-disaster interviews, of which 375 had been previously interviewed. Followup interviews took place approximately one year after the St. Louis disasters, and two years after the Puerto Rico disaster. Response rates for the post-disaster interviews were similar: in St. Louis the overall response rate was 84 percent; in Puerto Rico it was 87 percent. Only the post-disaster data are considered in the present analysis. Additional details about methodology, symptom levels, and prevalence rates of mental disorders for these samples are described elsewhere (10-11, unpublished paper by M. Bravo, M. Rubio-Stipec, G. Canino et al.).

Instrument

The St. Louis and Puerto Rico studies employed the same structured interview, the Diagnostic Interview Schedule/Disaster Supplement (DIS/DS) (12). The instrument includes scales covering selected DSM-III psychiatric diagnoses from the Diagnostic Interview Schedule (DIS) (13), including added indexes of generalized anxiety and post-traumatic stress disorder. The Disaster Supplement adds questions about special disaster exposure. Also included is a stressful life events scale which, in addition to assessing exposure to "common" life events, also contains a question about having been beaten or mugged (an event defined by DSM-IIIR as an extraordinary stressor). Modifications were made to the instrument by the Puerto Rican team, mostly for purposes of shortening the interview, including the substitution of the Duke University version of the ECA PTSD scale.

An important limitation of the datasets stems from the fact that the PTSD (and other DIS) questions were written prior to the publication of DSM-IIIR. Since the PTSD scales were based on DSM-III, some of the DSM-IIIR B and C criteria questions were not included. For present purposes, the PTSD questions included on the scales (excluding one about guilt) were regrouped to as closely as possible approximate the reexperiencing, avoidance, and arousal criteria as written in DSM-IIIR. Another limitation relates to the way that the PTSD questions were written, in that the stressor criterion was embedded in each symptom question. In other words, for a respondent to indicate having, say, an avoidant symptom, s/he would also have to have indicated having had an "approved" extraordinary stressor.

Results

Testing Criterion A: Are Extraordinary Stressors Unique Predictors of PTSD?

In order to test the utility of Criterion A (exposure to an extraordinary stressor), both common stressful events (job loss, move, break-up with spouse/lover, break-up with best friend, car quit running, housebreak/robbery, money difficulties, serious illness/injury, arrest/legal trouble, household illness/injury, household death, other close death, forced to take someone into household, other), and the extraordinary stressors (flood/mudslide or flood/dioxin disaster exposure, mugged/beaten), were entered as predictors in analyses of covariance (ANCOVA) which controlled for the effects of lifetime pre-disaster PTSD symptomatology. Separate analyses were conducted for the St. Louis and Puerto Rico data.

Levels of the effects in the models which showed significant F-values in Type IV partial sums of squares were compared using SAS least-squares means, which adjust for the effects of all factors in the model when estimating mean differences among factor levels. Used in unbalanced designs, least-squares means are estimates of the class means that would be expected had equal cell numbers been obtainable (14).

St. Louis. The overall St. Louis ANCOVA model accounted for 21% of the variance ($F=7.21$, $df=17$, 471, $p=.0001$). Too few respondents (two) indicated having been beaten or mugged for this factor to have been predictive of any symptomatology. However, other results confirmed the prediction that some of the "common" stressful events would relate more closely to PTSD symptoms than would the events "outside the range of normal human experience". More specifically, while disaster exposure in and of

itself did not significantly predict the level of PTSD symptoms ($N=184$, $F=3.82$, $df=1$, $p=.0513$), experiencing a move ($N=153$, $F=6.93$, $df=1$, $p=.0087$), money difficulties (i.e., "been sued for debt, had something repossessed, or had trouble with bill collectors"; $N=37$, $F=18.24$, $df=1$, $p=.0001$), household illness/injury ($N=95$, $F=4.41$, $df=1$, $p=.0363$), or some "other upsetting event" ($N=79$, $F=24.38$, $df=1$, $p=.0001$) did significantly increase PTSD symptomatology.

Of course the likelihood of experiencing these "common" events may substantially increase as a result of disaster exposure. The term "secondary disasters" has been coined to describe such adverse events, typically social in origin, which tend to occur during the recovery period (15). It has been speculated that secondary disasters may be even more important than the disaster event itself in predicting individual outcomes (16). Responses of the St. Louis victims would seem to support this speculation, in that exposure to disaster significantly related to experiencing other negative life events in the following year, including job loss, break-up with spouse/lover, break-up with best friend, housebreak/robbery, money difficulties, arrest/legal trouble, household illness/injury, forced to take someone into household, and other upsetting events. It may be that the subsequent negative events overrode the effect of disaster exposure for the St. Louis disaster victims. Along these lines, it should be noted that earlier studies of the St. Louis victims did show an association between PTSD symptomatology and direct exposure to disaster (11); however, those analyses did not control for exposure to other stressful events.

Puerto Rico. In the Puerto Rican sample, the overall model explained 11%

of the variance ($F=7.58$, $df=14$, 897 , $p=.0001$). Despite that fact that a substantial number of the respondents had experienced being beaten or mugged, this factor was not predictive of PTSD symptoms ($N=81$, $F=0.10$, $df=1$, $p=.7750$). Perhaps because the Puerto Rican disaster was so severe, disaster exposure did relate to increased levels of PTSD symptomatology ($N=353$, $F=10.78$, $df=1$, $p=.0011$). However, three more common stressful events also predicted PTSD symptomatology, and two of these related much more strongly to PTSD than did even this severe disaster. The three factors were breaking up with a best friend ($N=53$, $F=23.11$, $df=1$, $p=.0001$), having to take someone into one's home ($N=36$, $F=8.31$, $df=1$, $p=.004$), and other upsetting events ($N=81$, $F=16.85$, $df=1$, $p=.0001$). The question about money difficulties (a significant predictor in the St. Louis sample) was not asked of the Puerto Rican sample. Interestingly, unlike St. Louis, exposure to disaster did not systematically relate to experiencing subsequent stressful events in the Puerto Rican sample.

Testing Criteria B-D: Which Symptoms of PTSD Result from Disaster Exposure?

Relationship between disaster exposure and PTSD symptom clusters. The second set of analyses focussed on the prediction that disaster victims were reporting only a particular subset of the PTSD symptomatology. In a series of univariate analyses, responses to the questions associated with DSM-IIIIR Criteria B (re-experiencing), C (avoidance), and D (arousal), were each grouped and then cross-tabulated with disaster exposure. Results of these analyses are depicted on Table 1.

Insert Table 1 about here

For the St. Louis sample, the flood and dioxin victims were analyzed

separately to see if the different types of events produced different symptom patterns (victims of both events were included in both analyses). While flood exposure significantly related all three types of symptoms, chi-squared tests confirmed the prediction that the relation would be strongest for symptoms of reexperiencing. The pattern for dioxin victims was similar, but not identical. As shown on Table 1, dioxin exposure also significantly related to all three types of symptoms. However, the relation with dioxin exposure was much stronger for both the reexperiencing and the arousal symptoms than for the avoidance symptoms.

The analysis of the victims of the Puerto Rican mudslides/floods resulted in the same pattern as that found for the St. Louis flood victims. That is, while disaster exposure significantly related to all three types of symptoms, the relation was strongest for the reexperiencing symptoms (see Table 1).

Alternative explanations for infrequent reporting of the C and D symptoms. Two possible explanations could account for the apparent under-reporting of the avoidance and, for the flood/mudslide victims, arousal symptoms (PTSD Criteria C and D):

- 1) These criteria are misplaced, and are in fact symptoms of other disorders such as depression or anxiety, thus resulting in artificially high rates of co-morbidity among these diagnoses.
- 2) The criteria as written are correct, but the measures used to detect criteria C and D are flawed. While the diagnosis of PTSD clearly requires linkage between the stressor and the symptoms, the measurement issue is a question of who should be required to make this link. It is reasonable to expect that for re-experiencing symptoms (Criterion B), a traumatized

victim should be able to make this connection. However, this victim may well see no connection between his/her avoidance or arousal symptoms (Criteria C and D) and the traumatic event s/he has experienced. It may be that DIS and similar survey instruments require knowledge not available to the respondent, and thus underestimate rates of PTSD by failing to pick up the C and D symptoms (unpublished report by R. Hough).

In order to explore the latter explanation, some of the questions of the C and D criteria were examined in greater detail. Three of the PTSD symptoms in these categories closely resemble those asked in the context of depression: loss of ability to care about other people or activities, trouble sleeping, and trouble concentrating. The major difference is that the questions asked within the PTSD scale require the respondents to link their symptoms to a particular stressor event. For example, the PTSD question about trouble sleeping read, "Did you ever have trouble sleeping because of any horrible experience--either trouble falling asleep, staying asleep, or waking up too early?" On the depression scale the trouble sleeping question read, "(In the past year), have you ever had a period of two weeks or more when you had trouble falling asleep, staying asleep, or waking up too early?" Similarly, the PTSD question about trouble concentrating asked, "Have you had any horrible experiences that made you become unusually forgetful or have trouble concentrating?" This question on the depression scale asked, "(In the past year), has there ever been a period of two weeks or more when you had a lot more trouble concentrating than is normal for you?"

To test whether this requirement of the victims to link their symptoms to a particular traumatic event might be responsible for the apparent

under-reporting of PTSD symptoms, responses to the PTSD questions were cross-tabulated with the corresponding depression questions. This analysis was restricted to disaster victims only. Included in the analysis were symptoms of depression reported within the period following the disasters; these were compared to PTSD symptoms specifically reported as resulting from disaster exposure.

Insert Table 2 about here

Results supported the hypothesis that the linking requirement leads to an under-reporting of PTSD symptoms (see Table 2). In the St. Louis sample, 35 disaster victims reported loss of interest (a C criterion symptom) in activities usually enjoyed, on either or both the depression and PTSD scales. Of these, 77% reported this symptom only on the depression scale. In the Puerto Rican sample, 90 disaster victims reported loss of interest; a full 91% of these reported this problem only on the depression scale. While these results seem to strongly support the notion that the linking requirement results in an under-reporting of symptoms on the PTSD scale, it should be noted that the wording of this question on the depression scale was much broader. That is, while the PTSD scale asked, "Did you have any horrible experience that caused you to lose the ability to care about other people, or lose interest in things you used to enjoy?", the depression scale asked, "(In the past year), have you ever had a period of two weeks or more during which you felt sad, blue, depressed, or when you lost all interest and pleasure in things that you usually cared about or enjoyed?" Thus the respondents might have been responding affirmatively to the portion of the question inquiring about having felt blue, sad or

depressed, rather to the portion referring to loss of interest.

Fortunately, however, the Puerto Rican interview also included a much more specific depression question directed solely toward loss of interest in activities: "Has there been a period in which you lost interest in things such as work, hobbies, or things that you usually liked to do for fun?" This depression question had in fact a much narrower focus than the PTSD question, which also included loss of ability to care about others ("Did you have any horrible experience that caused you to lose the ability to care about other people, or lose interest in things you used to enjoy?"). An analysis of this question found similar results: of the 39 victims indicating loss of interest in activities on either the PTSD or depression scale, 79% reported this symptom only on the depression scale.

The other two sets of questions showed the same pattern. Of the 39 St. Louis cases reporting trouble sleeping (D criterion), 67% reported this problem only on the depression scale. Of the 71 Puerto Rico victims reporting trouble sleeping, 82% reported this problem only on the depression scale. With respect to the questions about trouble concentrating (D criterion), 48% of the 23 St. Louis victims reporting this problem noted it only on the depression scale. Of the 31 Puerto Rican victims reporting trouble concentrating since the disaster, 77% reported this symptom only on the depression scale.

To rule out the possibility that the victims had a history of depression which preceded the disaster, the St. Louis analyses were repeated, controlling for depression symptoms reported in the year before the disaster. The results were virtually identical. (The only change was the number of cases reporting trouble concentrating solely on the PTSD scale,

which fell from 9 to 8; in this analysis, 50% of the 22 St. Louis victims reporting this symptom noted it only in the depression scale.)

It should be noted that, apart from the linking requirement, the depression scale questions are actually much more stringent than those of the PTSD scale, in that respondents must have experienced the problem for at least two weeks to qualify as symptomatic on the depression scale. In contrast, respondents need only to have experienced the problem "ever" (i.e., however briefly) to qualify as having the symptom on the PTSD scale. Thus this analysis probably under-estimates the suppressing effect of requiring the respondents to link their own symptomatology to the traumatic event.

Conclusions and Implications

This study holds implications for revision of the PTSD criteria for DSM-IV. With regard to the stressor criterion, this study found that some of the "common" stressful events (moving, money problems, household illness, breaking-up with a best friend, involuntarily taking someone in) related more closely to PTSD symptoms than did the events "outside the range of normal human experience" (floods, mudslides, dioxin exposure, being mugged/beaten).

As noted earlier, the present findings are constrained by the way that the PTSD questions were written, in that the stressor criterion was embedded in each symptom question. The present analysis thus represents a very conservative test of the hypothesis. Were the questions reflecting the avoidance and arousal criteria asked independently of the stressor, with the link to the stressor established temporally (i.e., by time of onset), the findings would probably have supported the hypothesis even more

strongly.

These results suggest that the definition of trauma as "outside the range of usual human experience" is inappropriate. Since there are many, more common, events that also "would be markedly distressing to almost anyone" or at least to most people, it seems arbitrary to exclude these events from the diagnosis. It is more logical to assume that stressors form a continuum; some people may be more vulnerable to less extreme events, and yet still have full-blown PTSD.

Even if PTSD were ultimately found to be justifiably limited to extraordinary events, this is a conclusion that should be reached by careful empirical assessment, rather than by edict. From a research standpoint, keeping the stressor as a part of the diagnosis builds in a confound that makes it impossible to empirically assess PTSD as a response. For example, many individuals who have all of the Criteria B-D symptoms will not make diagnosis if their stressor (e.g., being sued) is not on the approved list. Others with an approved stressor (e.g., combat veterans) will be counted as PTSD even if the event they report that they are reexperiencing is their lawsuit. The present strategy forces researchers to define their results apriori, instead of allowing them to emerge from the data. A better strategy would be to first study whether PTSD symptoms emerge as a cluster, and independently ascertain what type of stressors result in this symptom pattern. However, this strategy is possible only if the stressor criterion is removed from the diagnosis.

In his description of the recent history and rationale behind the present approach to psychiatric diagnostic categories, Klerman (17) summarized the currently accepted strategy for establishing the internal

validity of mental disorders: "(T)he clinical syndrome is described with precision and standardization by means of descriptive symptoms and manifest behaviors. The effort is made to remove inferences as to possible causation from the syndromal diagnostic criteria. This contamination of description and causation was a serious flaw in DSM-II...Two exceptions to the rule are found in post-traumatic stress disorder and adjustment disorder, in which the clinical symptoms are related to recent stressful events" (p. 29).

From a scientific standpoint, the decision to make exceptions of these diagnoses was unfortunate, since it precludes both the above described assessment of internal validity, and also what Klerman (17) describes as the second stage of validation, involving the correlation of the syndrome with one or more external validators (e.g., life events, demographics). Criterion A is an etiological factor, and not an outcome. The findings of the present study support the rationale for DSM-III, and suggest that the stressor criterion should be removed from the diagnosis and reserved for Axis Four (psychosocial stressors). Were this change in the diagnosis adopted, it would of course require that clinicians take Axis Four seriously, and routinely incorporate information regarding experience with traumatic stress as a part of any diagnostic workup. This kind of attention to Axis Four considerations would appear to be clinically advisable in any case, since trauma has been found to be associated with a range of outcomes besides PTSD (e.g., anxiety, depression, substance abuse, anti-social personality (11, 18-20)).

Other study implications derive from the findings regarding the pattern of symptomatology expressed by the disaster victims in the present study.

While disaster exposure significantly related to all three types of symptoms, the relationship was strongest for the reexperiencing symptoms, and weakest for symptoms of avoidance/numbing. Two possible explanations were advanced for the infrequent reporting of both the avoidance and arousal symptoms (PTSD Criteria C and D): 1) these criteria are misplaced, and are in fact symptoms of other disorders; and/or 2) the criteria as written are correct, but the measures used to detect criteria C and D are flawed. Comparisons between responses to similar questions on the depression and PTSD offered support for the latter interpretation, since respondents were more likely to report these symptoms on the depression scale. This discrepancy holds important methodological implications for the assessment of PTSD, in that it suggests that a scale which requires respondents to be able to link their symptoms to a particular stressor event may lead to under-reporting of PTSD avoidance and arousal symptoms.

In and of itself, however, the above finding does not rule out the possibility that Criteria C and D might also be misplaced, and belong in other diagnoses. It should be noted that a major study of Vietnam veterans (21) employing an array of PTSD measures found that veterans were much more likely to score as PTSD cases on both the Structured Clinical Interview for DSM-III (SCID) (22) and Mississippi Scale for Combat-related PTSD (M-PTSD) (23) than on the DIS. It is noteworthy that the SCID and M-PTSD measures of PTSD have no linking requirement for the avoidance and arousal symptoms, again supporting the interpretation that this problem is methodological rather than diagnostic. However, even the SCID and M-PTSD seemed to yield low reporting of the avoidance symptoms as compared to the other PTSD symptom classes of PTSD (personal communication with J. Fairbank), leaving

open the possibility that the avoidance/numbing symptoms may actually belong within another diagnosis (see also 24).

Finally, it should be noted that this paper focuses entirely on sequelae fitting the current criteria for PTSD. While the St. Louis victims did not display this particular configuration of symptomatology as a direct result of their disaster exposure, they did show significantly higher levels of generalized anxiety than non-disaster victims, even after controlling for other negative life events. This calls into question the emphasis on PTSD as the sole, or even major, outcome of exposure to traumatic events (11, 18-20).

02079

OH100

COMMUNITY HEALTH CELL

326, V Main, I Block

Koramangala

Bangalore-560034

India

References

1. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, (ed. 3). Washington, DC, Author, 1980, pp 236-238
2. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, (ed. 3 revised). Washington, DC, Author, 1987, pp 247-251
3. Breslau N, Davis GC: Posttraumatic stress disorder: the stressor criterion. J Nerv Ment Dis 175:255-264, 1987
4. Horowitz MJ: Post-traumatic stress disorder. Behav Sci Law 1:9-2, 1983
5. Madakasira S, O'Brien KF: Acute posttraumatic stress disorder in victims of a natural disaster. J Nerv Ment Dis 175: 286-290, 1987
6. Steinglass P, Gerrity, E: Natural disasters and posttraumatic stress disorder: Short-term versus long-term recovery in two disaster-affected communities. J Appl Soc Psychol (in press)
7. Van Kampen M, Watson CG, Tilleskjor C, et al: The definition of posttraumatic stress disorder in alcoholic Vietnam veterans. J Nerv Ment Dis 174:137-144, 1986
8. Smith, EM: Chronology of Disaster in Eastern Missouri (Contract No. 83-MH-525181). Rockville, MD, National Institute of Mental Health, 1984, pp 1-58
9. Eaton WW, Kessler LG (eds): Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program. Orlando, Academic Press, 1985
10. Robins LN, Fischbach, RL, Smith, EM, et al: Impact of disaster on previously assessed mental health, in Shore JH (ed): Disaster Stress

Studies: New Methods and Findings. Washington, DC, American Psychiatric Press, 1986, pp 22-48

11. Smith EM, Robins LN, Pryzbeck, TR, et al: Psychosocial consequences of a disaster, in Shore JH (ed): Disaster Stress Studies: New Methods and Findings. Washington, DC, American Psychiatric Press, 1986, pp 50-76

12. Robins LN, Smith EM: Diagnostic Interview Schedule/Disaster Supplement. St. Louis, Washington University Department of Psychiatry, 1983

13. Robins LN, Helzer JE, Orvaschel H, et al: The Diagnostic Interview Schedule, in Eaton WW, Kessler LC (eds), Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program. Orlando, Academic Press, 1985, pp 143-170

14. SAS Institute, Inc: User's Guide: Statistics. Cary, NC, Author, 1982, p 177

15. Erikson KT: Everything in its Path: Destruction of Community in the Buffalo Creek Flood. New York, Simon and Schuster, 1976

16. Golec JA: A contextual approach to the social psychological study of disaster recovery. Int J Mass Emergencies Disasters 1:255-276, 1983

17. Klerman GL: Psychiatric diagnostic categories: issues of validity and measurement. J Health Soc Behav 30:26-32, 1989

18. Keane TM: Post-traumatic stress disorder: Current status and future directions. Behav Ther 20:149-153, 1989

19. Sierles FS, Chen JJ, Messing ML, et al: Concurrent psychiatric illness in non-Hispanic outpatients diagnosed as having posttraumatic stress disorder. J Nerv Ment Dis 174:171-173, 1986

20. Solomon SD, Regier DA, Burke, JD: Role of perceived control in

coping with disaster. J Soc Clin Psychol (in press)

21. Kulka RA, Schlenger WE, Fairbank JA, et al: National Vietnam Veterans Readjustment Study (NVVRS): Description, current status, and initial PTSD Prevalence Estimates. (VA Contract No. V101 (93)P-1040). Research Triangle Park NC: Research Triangle Institute, July 1988, 22-41
22. Spitzer RL, Williams JB: Structured Clinical Interview for DSM-III, Patient Version. New York, Biometrics Research Department, New York State Psychiatric Institute, 1985
23. Keane TM, Caddell JM, Taylor KL: Mississippi scale for combat-related posttraumatic stress disorder: Three studies in reliability and validity. J Consult Clin Psychol 56:85-90, 1988
24. Ross RJ, Ball WA, Sullivan KA, et al: Sleep disturbance as the hallmark of posttraumatic stress disorder. Am J Psychiatry 146:697-707, 1989

Table 1

Disaster as a Predictor of Different types of PTSD Symptoms

Event (N)	PTSD symptom category*	% of victims with a symptom	χ^2_{**}	P value
St. Louis Flood (154)	B	17%	12.27	.000
	C	6	3.97	.046
	D	10	6.77	.009
	B	23	24.23	.000
	C	7	4.88	.027
	D	16	24.68	.000
Puerto Rico Flood/ Mudslides (353)	B	12	16.47	.000
	C	12	10.19	.001
	D	15	9.63	.002

* B = Intrusiveness; C = Numbing; D = Arousal.

** All chi-squared values in table were associated with one degree of freedom.

Table 2

Symptoms Reported by Victims since Disaster: Depression versus PTSD*

Symptom	St. Louis Flood/Dioxin Victims				Puerto Rico Flood/Mudslide Victims			
	Scale where reported		Scale where reported		Scale where reported		Scale where reported	
	Depression Only N(Z)	PTSD Only N(Z)	Both N(Z)	Total N(Z)	Depression Only N(Z)	PTSD Only N(Z)	Both N(Z)	Total N(Z)
Loss of interest (and/or sad)	27 (77)	3 (9)	5 (14)	35 (100)	82 (91)	3 (3)	5 (6)	90 (100)
Loss of interest** (activities)	--	--	--	--	31 (79)	4 (10)	4 (10)	39 (100)
Sleep disturbance	26 (67)	5 (13)	8 (21)	39 (100)	58 (82)	10 (14)	3 (4)	71 (100)
Trouble concentrating	11 (48)	9 (39)	3 (13)	23 (100)	24 (77)	5 (16)	2 (6)	31 (100)

* PTSD symptoms must have been reported to result from disaster.

** Not asked of St. Louis sample.

Solomon, S.D. (1989). Research issues in assessing disaster's effects. In R. Gist and B. Lubin (Eds.), Psychosocial Aspects of Disaster. New York: Wiley and Sons.

CHAPTER 12

Research Issues in Assessing Disaster's Effects

SUSAN D. SOLOMON

This chapter highlights methodological considerations of importance in planning systematic assessments of the effects of disaster. The discussion is predicated on the assumption that the reader is familiar with basic research techniques involved in the conduct of epidemiological surveys, quasi-experimental studies, and clinical trials. The intent is therefore not to discuss how such studies should be conducted, but rather to describe when these techniques are most appropriately applied to the study of disaster and to note the likely pitfalls and opportunities awaiting the investigator of disaster's effects.

The importance of systematic disaster research, in terms of both theory development and intervention planning, cannot be overestimated. An extensive amount of research has already been conducted on the mental and physical effects of stress. However, much of the early work was conducted in a laboratory setting, using such aversive stimuli as repeated shocks or noise bursts as stressors (e.g., Glass & Singer, 1972; Roth & Bootzin, 1974). Although the theoretical contributions of such studies have been substantial, many investigators have more recently become disenchanted with the laboratory setting as an avenue for understanding reactions to "real world" stressful events, because the laboratory experiment is incapable of recreating those aspects of greatest theoretical and practical concern (e.g., the role of predictability, duration and/or scope of the event, long-term changes in physical and/or mental health, etc.; for a more detailed discussion, see Wortman, 1983; Wortman, Abbey, Holland, Silver, & Janoff-Bulman, 1980). As a consequence, investigators have increasingly turned toward investigations in natural settings as a means of enhancing the understanding of stress.

Although moving research on generalized stress into the real world may help to address many criticisms regarding external validity, it also opens

The author would like to thank Ben Locke for his thoughtful comments on an earlier draft of this chapter.

this research to a host of interpretation problems. The particular theoretical value of research on disaster lies in its ability to minimize some of the difficulties in interpretation associated with the study of more common stressful events. The amount of variance explained by exposure to common life events is typically quite small (Rabkin & Struening, 1976). Helzer (1981) suggests that if stress is an important contributor to illness, extreme events should show a stronger relationship to later outcomes than would more common stressors. Selection bias is also minimized in these studies, because respondents are identified on the basis of exposure to the disaster event rather than on the basis of, for example, health records, which may be more a measure of help-seeking behavior than illness per se (Mechanic, 1974). Further, since the occurrence of disaster is primarily outside the individual's control, these studies avoid problems of confound between the event and symptoms of illness. In studies of more common, controllable stressful events (e.g., divorce, job loss), it is difficult to assess whether an illness such as depression represents an antecedent or a consequence of the event (Dohrenwend, 1974). Disasters, because they are extreme, are unlikely to be confused with the symptoms or consequences of illness (see Helzer, 1981).

Disaster studies are not only of theoretical significance, but of great practical importance as well. It has been estimated that between 1970 and 1980 almost 2 million American households each year experienced injuries and/or damages from either fire, floods, hurricanes, tornadoes, or earthquakes (Rossi, Wright, Weber-Burdin, & Perina, 1983). Further, human-made disasters such as chemical pollution, transportation accidents, explosions, structural failures, terrorism, and the like, may pose an ever-increasing threat to physical and mental health. Although the extent of exposure to technological disaster is difficult to estimate, a 1980 Senate subcommittee concerned with only one such hazard (chemical dumps) noted that as many as 30,000 sites may be capable of causing significant health problems due to their proximity to public groundwater drinking supplies (Cohn, 1980). These estimates underline the importance of establishing the extent of psychiatric disturbance resulting from exposure to natural and human-made disaster, of identifying characteristics of events and/or individuals that put victims at high risk, and of identifying effective interventions by which to prevent or treat the mental and physical consequences of exposure to extreme stress.

This chapter attempts both to delineate dimensions of the disaster-response syndrome and to discuss some of the methodological difficulties associated with the study of psychosocial aspects of disaster. In line with Green's (1982) distinction between *actual* and *methodological* dimensions of disaster research, the discussion first addresses aspects associated with the disasters and the victims themselves which affect actual impairment and recovery rates (i.e., true scores). The focus then shifts to methodological issues that may affect estimates of these rates of impairment and recovery, emphasizing consideration of a range of reactions and consequences, as well as potential mediators of the victim's response to the stressful event. Methodological

considerations pertinent to the design and execution of various types of risk factor and intervention studies are then outlined, with concluding remarks addressing constraints either inherent to disaster research or currently imposed on these studies by the state of the art.

ACTUAL DIMENSIONS OF THE DISASTER-RESPONSE SYNDROME

This section of the chapter addresses those components of the disaster experience that affect actual responses to exposure. Problems that confront researchers attempting to identify the underlying dimensions of the disaster-response syndrome include defining what constitutes a disaster, developing a taxonomy of disaster that permits cross-event comparisons, distinguishing between transient reactions and severe consequences, and identifying intervening factors that mediate individual responses to these events.

Defining Disaster

Perhaps the most immediate problem associated with the conduct of disaster research is the lack of agreement about what constitutes a disaster (see Chapter 2 and Quarentelli, 1985, for more detailed discussions). For example, Cohen and Ahearn (1980) define disasters as "extraordinary events that cause great destruction of property and may result in death, physical injury, and human suffering" (p. 5). As Baum (1986) points out, however, a definition of this nature rules out such events as the Three Mile Island nuclear reactor accident, because no observable damage to property or life ensued from that event. Barton's (1969) definition is broader, classifying disasters as a subset of "collective stress situations" that occur when a social system fails to provide many of its members with the expected conditions of life. However, this definition poses problems as well, based as it is on the concept of stress, for which a consensus of definition is also lacking (for reviews, see Burchfield, 1979; Elliott & Eisdorfer, 1982).

Stress research has been criticized as tautological: stressors are events that produce a stress response; stressors are negative because they are associated with unwanted consequences (Elliott & Eisdorfer, 1982). Disaster research, as a study of collective stress, is subject to the same criticism: an event is a disaster because its consequences are disastrous (cf. Baum, 1986).

The present discussion is based on the definition of stress adopted by the Institute of Medicine (Elliott & Eisdorfer, 1982). This definition identifies three basic components in the stress sequence: *activators/stressors* (environmental events that change an individual's present state), *reactions* (transient biological or psychosocial responses to an activator), and *consequences* (prolonged or cumulative effects of reactions). *Mediators* are defined as the

modifiers that act on each of these components to produce individual variations in the stress sequence.

Types of Disaster—Defining the Stressor

Many events are potential stressors. In an effort to move the field toward the identification of the critical elements of disaster that make it a stressful experience, several taxonomies have been proposed. For example, Barton (1969) examines disasters in terms of scope of impact, speed of onset, duration of impact, and social preparedness. Berren, Beigel, and Ghertner's (1980) model uses as criteria type of disaster, duration of disaster, degree of personal impact, potential for (re)occurrence, and control over future impact. (See Chapter 2 for a more extensive discussion of disaster typology). Although the different models may emphasize somewhat different elements, they share a desire to provide some cohesion to disaster research, to enable comparisons across studies of disasters' effects.

The potential utility of a taxonomy for research on disaster is exemplified by the work of Baum and his colleagues. In a careful review of disaster literature, Baum, Fleming, and Singer (1983) contrasted the effects of technological hazards with those of natural disasters. These investigators identified several features that distinguish natural disaster from human-made catastrophes, including perceptions of control, duration of impact, presence of an identifiable low point, and the like. They inferred from their review of extant literature that technological hazards are more likely to have long-term consequences on mental health than are natural hazards.

Complicating their attempt to isolate the elements of technological disasters that account for the greater psychological consequences of these events was a confound posed by the type of events chosen for study in past investigations. Most of the natural disasters were short-term events with a recognizable low point, after which conditions slowly improved (e.g., hurricanes, floods). In contrast, the studies of technological hazards tended to focus on chronic events whose long-term consequences have been uncertain (e.g., exposure to toxic chemicals or radiation).

Baum and his colleagues used their taxonomy as a basis for designing research that would untangle this confound. Their current investigation involves multisite comparisons of disasters that differ in both origin and duration. By deliberately including chronic, natural disasters (e.g., drought, radon exposure) and acute, technological breakdowns (e.g., explosions, transportation accidents) along with the more frequently studied kinds of events (e.g., exposure to toxic waste, floods) these investigators hope to ascertain whether the component of chronicity or the component of human origin has made long-term recovery from technological hazards more difficult than the recovery from natural events. The practical significance of work such as this is potentially great: By identifying events that put victims at

highest risk, this research will assist mental health practitioners in targeting their interventions toward victims in greatest need of assistance.

Types of Response—Reactions and Consequences

Taxonomies of disaster help to determine which aspects of an event make the experience stressful. However, disaster research needs to examine not only the *stressor* but also the other components of the stress sequence: *reactions* and *consequences*. Systematic attempts to separate reactions from consequences are rare and somewhat difficult to make. As noted earlier, the Institute of Medicine uses these terms to differentiate between transient responses and prolonged effects (Elliott & Eisdorfer, 1982). One interpretation of this definition suggests that the identical responses might constitute either reactions or consequences, depending on when they are measured (an issue of timing). Alternatively, the definition might be interpreted as suggesting that the type of response is also central to this distinction (an issue of both quality and severity).

These distinctions may sound academic, but scrutiny of the diagnosis of post-traumatic stress disorder (PTSD) illustrates their importance to disaster research. Post-traumatic stress disorder is the mental illness of greatest relevance to the experience of disaster (see Chapter 9 for a more detailed discussion of this syndrome). Although traumatic neurosis has been an important psychiatric concept since the turn of the century (Horowitz, 1976; Kardiner & Spiegel, 1947), the diagnosis PTSD was not recognized as a clinical entity until the recently published third version of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III; APA, 1980). Earlier formulations of the manual tended to describe stress disorders as acute, transient phenomena that diminish over time, unless some premorbid character weakness is present to prolong symptom maintenance (Green, Lindy, & Grace, 1985). Thus posttraumatic stress was originally viewed as a transient reaction to a stressor.

More recent conceptualization recognizes the possibility of prolonged psychological *consequences*. Follow-up of survivors of Hiroshima and the Holocaust, as well as other victims of World War II, made it apparent that some experiences are so traumatic that even previously normal individuals suffer serious, prolonged consequences when exposed to such events (see Green, Lindy, & Grace, 1985, for a thoughtful discussion of this topic). Studies of two different disasters (fire and dam breaks) found that particular stressors present in both events (loss of a loved one, threat to one's life) increased the risk of symptomatology 2 years later, despite significant differences in levels of pathology in the two events studied (Gleser, Green, & Winget, 1981; Green, Grace, & Gleser, 1985). These studies also showed that certain stressors were associated with delayed symptoms (i.e., first appearance 2 years rather than 1 year postimpact). These findings suggest that both timing and severity of PTSD symptoms must be taken into account

in studies differentiating transient reactions from consequences of disaster exposure.

Indeed, present formulations of post-traumatic stress disorder indicate that the syndrome is cyclical, with alternating periods of intrusiveness, numbing, and quiescence (Horowitz, 1976). Until the late 1960s, epidemiological studies of disaster focused primarily on the period immediately following impact (Logue, Melick, & Hansen, 1981). These studies concentrated on surveillance for outbreaks of communicable diseases and increased mortality directly resulting from disaster (e.g., suicide, cardiovascular deaths from overexertion, environmental hazards created by the event). The current understanding of post-traumatic stress disorder suggests the need for longitudinal research to capture not only the immediate physical effects of disaster but also the prolonged or delayed incidence of psychiatric disorder, as well as the natural course of such disorder when left untreated.

Even this expanded focus may be shortsighted if changes in life functioning and other early behavioral problems following disaster exposure are overlooked. These changes are important not only as potential precursors of subsequent mental disorder, but also in their own right, as building blocks in theories of stress and coping. For example, not enough is known about what constitutes good adjustment to a traumatic event (Wortman, 1983). Investigators have identified several characteristics considered indicative of good coping, such as keeping emotional distress within manageable limits, being able to function and achieve socially desired goals, and maintaining a positive attitude (e.g., Hann, 1977; Meyers, Friedman, & Weiner, 1970; see Silver & Wortman, 1980, for a review and detailed discussion). However, Wortman (1983) points out that some research evidence suggests that these factors are not always associated with effective coping. For example, Goldsmith (1955) found that individuals who were most upset by spinal cord injury made greater progress toward rehabilitation than did patients appearing to be less upset. Similarly, lack of distress following bereavement could hardly be construed as effective adjustment, because available evidence suggests that almost all bereaved are intensely distressed following their loss. Silver and Wortman note the need for normative information on how people react to similarly stressful events after varying lengths of time, as a means of assessing how well an individual is coping. This research gap can only be addressed by systematic, longitudinal studies measuring a range of reactions to traumatic events.

Mediators of Disaster Response

In addition to gaining a better understanding of the components of the stress sequence, it is also important to isolate factors that act on these components to affect the development and maintenance of prolonged consequences, as opposed to more transient reactions. Mediators are modifiers that act on the stress sequence to produce individual variations in reactions to, and con-

sequences of, potential stressors. Mediators play a central role in determining how victims react to disaster and what physical and mental health consequences these reactions produce. Types of mediators and their differential effects at each stage of the stress sequence need to be investigated to help identify those victims likely to develop prolonged effects (Elliott & Eisdorfer, 1982).

Community Level Mediators

One important class of mediators of psychological responses to disaster relates to the community context of the event (see Chapter 1). Community-level factors that potentially affect individual response include the extent of community disruption, the scope, the centrality (e.g., an airplane crash involving a group of strangers would be peripheral rather than central; see Green, 1982, for a discussion), the setting of the community (e.g., rural vs. urban), and the nature of the community response (e.g., solidarity vs. conflict; for a discussion of this topic with regard to toxic contamination, see Edelstein & Wandersman, 1987).

Golec (1983) argues that community-level variables may be even more important than the disaster event itself in predicting individual outcomes. Her analysis of the 1976 Teton Dam collapse suggests that an unusually positive community response to the disaster resulted in remarkably rapid recovery. Despite substantial material loss and social disruption (70% of the homes in the county were severely damaged or totally destroyed), several community characteristics optimized recovery: adequate warning, a low death/injury rate, a highly integrated and homogeneous (Mormon) population, effective local disaster response, maintenance of social networks, adequate financial compensation, and a surplus of resources for immediate needs. As a result of these factors, few of what Erikson (1976) has termed *secondary disasters* ensued. Secondary disasters are adverse events occurring during the recovery period, generally of social origin. In the Teton Dam disaster, examples of secondary disaster included excessive profiteering and abuses in an unregulated construction industry and regulatory inequities in the postdisaster compensation program. The relatively few victims of these secondary disasters were more likely than other flooded residents to perceive themselves as victimized and to express greater negative affect and loss of self-esteem. Systematic comparison of communities varying in characteristics that affect the rate of recovery and incidence of secondary disaster may help identify intervening variables of importance in the prediction of individual psychological outcomes (see also Green, 1982; Logue et al., 1981).

Social Mediators

The victim's social network includes kin, friends, neighbors, and community gatekeepers (see Mitchell & Trickett, 1980; Solomon, 1986; for extensive discussions of this topic). Like community response, the immediate social environment can be an important mediator of individual outcomes following

exposure to disaster. For example, the initial reactions of other family members may serve to define the severity of the event to the victim. Family members may disagree about what actions, if any, to take, thereby prolonging the uncertainty of events that are intrinsically ambiguous (e.g., exposure to toxic waste, radon contamination of the home).

Along these lines, a study currently funded by the National Institute of Mental Health (NIMH) has initial family response to disaster as its focus: Steinglass and associates at George Washington University, Washington, D.C., are examining the extent to which family disorganization in the face of disaster-initiated relocation places individuals at higher risk of long-term maladjustment than does a more coherent proximal family response to this stressor. Findings from a study by Handford, et al. (1983) illustrate the importance of initial family response as a predictor of individual consequences. In this investigation of the 1979 nuclear reactor accident at Three Mile Island (TMI), the reactions of children were not found to relate to the intensity of their parents' response. However, children of parents who disagreed in their reactions to the event were significantly more upset than children of parents who responded consistently, even when both parents were highly distressed.

Although the Handford study (Handford et al., 1983) illustrates the way in which the initial disaster reactions of family members may heighten the stress of a victim, the family's long-term adaptation may similarly affect individual consequences. Some research suggests that females may be more upset by their spouses' response to disaster than they are by the event itself (Gleser et al., 1981; Solomon, Smith, Robins, & Fischbach, 1987). The latter study examined victims of a combination of natural and/or technological disasters: dioxin contamination, flooding, tornadoes, and radioactive contamination of well water. This study found that although the symptomatology of male victims (specifically, alcohol abuse and depression) increased as a result of disaster exposure, female symptomatology did not. Individuals of either sex who were both exposed to disaster and subject to substantial network demands experienced significantly more negative psychiatric consequences than victims less heavily relied upon by persons around them. However, excellent spouse support ameliorated the negative effects of exposure for males, whereas its presence intensified the level of symptomatology in female victims. These results suggest the possibility that, for some, strong family ties may be more burdensome than supportive in times of extreme stress (see Solomon, 1986; Solomon et al., 1987).

Individual Predispositions

Another set of mediators of disaster response deserving of research attention relate to the individual characteristics of the victim. Individual characteristics most frequently studied in disasters tend to be demographic variables, such as age, sex, ethnicity, education, and income level (see Elliott & Eisdorfer, 1982, for a more extensive discussion).

Anecdotal evidence suggests that certain demographic groups may be at higher risk than others for psychological disturbance following exposure to disaster (e.g., children, elderly, the mentally ill; cf. Cohen & Ahearn, 1980, pp. 9-10). NIMH is currently funding epidemiological studies of the effects of disaster on two of these potentially high-risk groups: Smith and colleagues at Washington University in St. Louis, Missouri, are examining the responses of children to dioxin and/or flood exposure, and Norris and associates at the University of Louisville in Kentucky are investigating the effect of repeated flooding on the mental health of the elderly. Studies such as these will provide more concrete information for targeting mental health services than has been available in the past. For example, conventional wisdom regarding the special vulnerability of the elderly may in fact be wrong; it is equally possible that the elderly constitute an unusually hardy population, and that individuals with prior flood experience may be inoculated against disaster's most stressful effects.

Other individual mediators of disaster effects that have received research attention include psychiatric history and cognitive/emotional factors, such as the subjective appraisal of the event, the nature of the coping response, and attributions of blame for the event (Baum et al., 1983; Lazarus & Launier, 1978; Solomon & Fischbach, 1986).

Formal Interventions

A final category of mediators is comprised of the *formal interventions* provided to actual or potential disaster victims. Formal intervention can take place at several levels: primary prevention, secondary prevention, or treatment. *Primary prevention* efforts are directed toward the prevention of negative mental health reactions to disaster exposure. Some examples of primary prevention include techniques for building stress resistance in high-risk groups, such as rescue workers, and policies that encourage the preservation of existing support networks (e.g., relocation plans that retain natural social groups of evacuees and permit access to established transportation systems; see Solomon, 1986). *Secondary prevention* interventions are directed toward the prevention of long-term consequences in victims who display early symptoms of stress and/or behavioral dysfunction following exposure. Potential secondary interventions include arranging for participation in self-help group sessions tailored to subgroups of victims with common problems (e.g., women's groups, parent groups; see Levin, Groves, & Lurie, 1980; Solomon et al., 1987), and stress debriefing sessions for emergency workers (Mitchell, 1982). Finally, *formal treatment* for post-traumatic stress disorder includes possible interventions such as behavioral flooding techniques or pharmacotherapy using beta blocking agents that limit physiological arousal. Although the efficacy of any particular intervention technique is yet to be established, experience with one or more of these formal interventions may potentially modify the development or expression of stress responses in victims of disaster.

METHODOLOGICAL DIMENSIONS AFFECTING ESTIMATES OF DISASTER EFFECTS

The preceding discussion offers an overview of important disaster characteristics, potential outcomes, and community, social, individual, and formal mediators of responses to disaster. Although an extensive list of factors has been mentioned, the foregoing inventory is far from exhaustive. Investigators have approached this daunting array of variables in a number of different (and overlapping) ways, each of which has strengths and weaknesses.

Risk Factor Studies

Green (1982) suggests that studies regarding the psychological effects of disaster can be divided into three types, depending upon the kinds of information they are designed to yield. Some studies are prospective, epidemiological surveys (*population-based studies*), which Green characterizes as a group-focused approach designed to determine rates of psychological impairment following disaster exposure. The relation of this approach to the earlier discussion of the disaster-response syndrome is that the major focus of the design is on degrees of exposure to the *stressor*. A second kind of study is the *clinically descriptive* investigation; the intent of this work is to uncover the constellation of symptoms found in disaster victims. In terms of the disaster-response syndrome, the focus of such investigations is primarily on the *reactions or consequences* of exposure. The third kind of study identified by Green is designed to uncover factors in a particular situation that affect individual outcomes, including characteristics of the disaster itself (scope, duration, etc.), as well as intervening characteristics that mediate disaster effects (e.g., community and family response, demographics, coping style). In other words, this *process* type of investigation places relatively more emphasis on *mediators* of the disaster response. Green notes that the three types of studies are not mutually exclusive and that many studies address more than one of these goals. For purposes of the present chapter, all three kinds of studies will be termed *risk factor studies*. The following discussion addresses a number of important considerations in the design of studies of the psychosocial effects of disaster. As the foregoing analysis suggests, no single study is expected to simultaneously address all of the concerns highlighted in the discussion. Which of these considerations should be taken into account and how they should be addressed will vary according to the objectives of a particular investigation.

Population-Based Studies

Some investigators, seeking a direct assessment of risk of impairment, attempt to solve the disaster response puzzle empirically. Because the intent of the inquiry is primarily descriptive rather than explanatory, questions guiding the design are often broad and atheoretical (e.g., will disaster victims

have higher rates of impairment than nonvictims?) or open-ended (e.g., which types of losses result in greatest psychological disturbance?). The study design emphasizes careful selection of the sample so as to include comparison groups varying in levels/types of exposure. The instruments employed (generally interviews and/or questionnaires) are designed to be comprehensive, so as to tap into as many of the dimensions of the disaster-response sequence as possible and to be useful in studies of a range of disaster events.

An example of this approach to disaster research is an effort undertaken by the National Institute of Mental Health. In 1983, when NIMH began a special program to fund research grants on emergencies, the inability to make comparisons across studies of different disasters was viewed as the major problem plaguing the field (see Green, 1982). Studies varied substantially in the types of emergencies examined, the nature of loss experienced by the victim, and the degree of disruption experienced by the community. Victims also varied in coping skills, in access to personal support systems, and in exposure to formal programs of assistance. Studies differed with respect to which of these situational, individual, and institutional factors were examined. Finally, almost every study employed different tools for measuring mental health effects, and different time frames for outcome assessment. All of these differences contribute to the difficulty in comparing study findings and in drawing valid conclusions regarding the extent of impairment resulting from different kinds of disaster experiences. In recognition of the problem, NIMH's Emergency/Disaster Research Program collaborated with Washington University at St. Louis, Missouri, in a project to develop an instrument for the assessment of victims' experiences and responses to a range of natural and technological emergencies (Robins & Smith, 1983). This instrument, the Diagnostic Interview Schedule/Disaster Supplement (DIS/DS), was designed to provide a comprehensive picture of the emergency experience and to be applicable across a wide range of emergencies. The instrument assesses the type of emergency, type and extent of loss, individual and family risk factors, use of formal and informal support systems, behavioral response to the traumatic event, and 15 DSM-III diagnoses selected for their potential relevance to the disaster experience. The instrument was subsequently employed in an epidemiological project which assessed mental health effects of exposure to dioxin, radioactive contamination of wells, flooding, tornadoes, and work layoffs (Robins, Fischbach, Smith, Cottler, & Solomon, 1986; Smith, 1984; Smith, Robins, Przybeck, Goldring, & Solomon, 1986). Selected portions of the instrument are also being used in other disaster research funded by NIMH, thereby enabling subsequent cross-disaster comparisons of impairment rates.

ADVANTAGES. One strength of the population-based approach is that it is prospective in design, allowing for both direct estimates of impairment and inferences of disaster effects as they may change over time. The fore-

going discussion suggests another major strength of this design: the comprehensiveness of the structured instrument. By maximizing coverage of disaster characteristics, mediators and types of outcomes, the resulting data permit both the analysis of multiple study questions and the determination of potential confounds. For example, the investigators of the St. Louis dioxin/flood disaster were concerned that respondents in the exposed and unexposed groups might differ in ways related to their impairment rates, but independent of their disaster experience. Assessment of potential confounds such as socioeconomic status and psychiatric history allowed these investigators to determine if the study results needed to be qualified by key predispositional factors (see Smith et al., 1986; Solomon et al., 1987). The comprehensiveness of the DIS/DS also serves to enhance its utility across a range of disaster events, thereby permitting the kind of standardized assessment needed for cross-study comparison of results.

PROBLEMS WITH THE POPULATION-BASED APPROACH. The comprehensive, longitudinal approach to assessing psychosocial effects of disaster has inherent shortcomings as well as strengths. At a practical level, such studies are complicated and expensive to conduct. Large sample sizes are required to detect differences in rates for disorders whose natural occurrence is rare in the general population (e.g., post-traumatic stress disorder). Further, multiple assessments over time are needed for inferences about the natural course of disorder following the traumatic event.

In addition, high response rates are needed to avoid the potential bias created by respondent self-selection. If, for example, only the victims least affected by the disaster are willing to take time to respond to the interview, no valid conclusions can be drawn about disaster exposure. A lengthy interview may work to the disadvantage of attaining high response rates by discouraging participation among those already overburdened by disaster-related demands on time and energy. Investigators may find it necessary to pay respondents a sizable sum to encourage participation in these time-consuming interviews.

Although subject payment may address the problem of response rate, it does not ensure the validity of the collected data. For example, lengthy interviews may bring about increasing reluctance on the part of the victims to admit to problems they may be experiencing at the time of reinterview, because any such admission would trigger a series of related questions designed to probe the initial response. In addition, structured instruments designed to yield psychiatric diagnoses require careful validation procedures to ensure that these diagnoses correspond to the ones that would be reached by expert clinicians interviewing the same individuals (see Burke, 1986, for a detailed discussion of this topic).

A further problem to consider in the design of population-based investigations (or indeed, in the design of any risk factor study) is the lack of baseline information on victim functioning prior to disaster exposure. Psy-

chosocial studies of disasters are typically initiated after the event has occurred, making it difficult to assess whether observed symptomatology is a direct result of the event, or rather evidence of a preexisting psychiatric problem.

A final problem associated with the analysis of population-based data is known as the "fishing expedition"; that is, the problem of multiple comparisons (Saxe & Fine, 1981). In studies that employ hundreds of questions, a small percentage of comparisons (5 out of 100), are likely to differ significantly as a result of chance, although no actual difference exists. Unanticipated findings are common in studies where large numbers of variables have been examined. The problem imposed by "too rich" data must be carefully addressed in both the analysis and the presentation of study findings (see Fleiss, 1986, and Walker, 1986, for contrasting views on this issue).

SOLUTIONS. One way of overcoming some of the problems with the population-based approach is to capitalize on existing data bases. For example, the Epidemiologic Catchment Area (ECA) studies funded by NIMH yielded a wealth of longitudinal information about the incidence and prevalence of 35 DSM-III mental health disorders in five sites across the country (see Eaton & Kessler, 1985). These data are now available for public use. In many instances these data can serve as normative information (i.e., a comparison group) for investigators who wish to administer the DIS or DIS/DS on a sample exposed to disaster in a demographically similar community. By eliminating the need to collect longitudinal data on a "no exposure" control group, this strategy minimizes the cost of conducting a full-blown epidemiologic study.

Investigators interested in learning about other data sources available for public use may wish to consult the annual DHHS Data Inventory (Department of Health and Human Services, 1985). However, researchers deciding to employ any of the data sources listed in this inventory should proceed cautiously. Listings do not always reflect the most current information on these data. In addition, some of these data bases may suffer from poor response rates, and unassessed reliability and/or validity.

Another way of capitalizing on existing data is to reanalyze longitudinal data collected for other purposes. For example, Norris and Murrell (1987) conducted a multiwave longitudinal study of the mental health of older Kentucky residents. When Norris noted that a substantial number of their respondents had been involved in flooding over the data collection period, she applied for an NIMH grant to reanalyze the data, with disaster exposure as the focus of the new analysis.

Capitalizing on existing data may serve not only to minimize the cost of conducting population-based studies of disaster, but also to provide baseline information about functioning prior to the experience of victimization. Few investigators are in the fortunate position of having detailed information on victims' psychiatric status prior to disaster impact. However, other proxy

measures of functioning may be readily available, such as records maintained by schools, employers, and medical facilities. Attaining access to such records would enable longitudinal assessments of, for example, school attendance and achievement, work performance, systolic blood pressure, number of prescriptions, and visits to physicians and/or mental health professionals. Inferences about disaster effects can be made from comparisons of these factors before and after disaster exposure, for both victims and selected comparison samples. This kind of information can be used to validate respondents' retrospective self-reports of functioning, which are open to recall bias.

Finally, the problem of too rich data can be addressed by statistical methods designed to test families of comparisons, such as the ones derived by Bonferroni, Tukey, and Scheffe (see Neter & Wasserman, 1974).

Clinical Studies

A second kind of risk factor study, the *clinical* or *case-control study*, focuses on the reactions and consequences of exposure to traumatic events. Green (1982) suggests that the goal of this kind of work is the explication of the cluster of symptoms found in disaster victims, so as to contribute to theoretical understanding of disorder and treatment. Although Green does not provide further detail, it may be inferred that studies of this nature include those with post-traumatic stress disorder as the focus of the design. In contrast to the population-based studies described above, these investigations tend to be retrospective in nature. Comparisons are made between cases and noncases, in order to discover how individuals with PTSD differ from those without the disorder in terms of precipitating events, predispositional factors, and co-occurring symptomatology.

ADVANTAGES. The clinical investigation offers a number of advantages over the population-based study as a means of investigating the relation between stressor and disorder. Foremost among these advantages is the cost savings involved in the sampling procedure. Unlike the prospective approach, clinical investigations do not require large study populations and long periods of observation. Because the incidence of PTSD in the general population is relatively rare (depending how a case is defined; see subsequent discussion), a prospective study of the relationship of various factors to the development of the disorder requires the screening of vast numbers of people (Lilienfeld & Lilienfeld; 1980).

In contrast, retrospective studies begin with already identified cases. This procedure not only is less costly, but also eliminates the possibility that study participation will influence the development and/or reporting of disorder. For example, respondents in a prospective study of the effects of exposure to dioxin contamination may become hypervigilant about their own physical and mental health, and may change their health care behavior as a

result of concerns heightened by study participation. Retrospective identification of cases removes the potential risk for this kind of response bias.

PROBLEMS WITH THE CLINICAL APPROACH. Retrospective clinical studies have several methodological disadvantages. First, unlike population-based studies, no direct estimate can be made of incidence, that is, of the risk of developing a disorder as a result of disaster exposure. In a retrospective study, the estimate of relative risk is made indirectly on the basis of existing cases (prevalence). As Kahn (1983) notes, the most basic requirement for obtaining risk estimates in retrospective studies is that both cases and non-cases in the study be representative with respect to the risk factor being investigated. Suppose, for example, that an investigator wishes to assess retrospectively the role of a local disaster as a risk factor for post-traumatic stress disorder. To do so, the investigator goes to the local private psychiatric facility and obtains lists of patients with and without PTSD and queries these individuals about their exposure, or lack of exposure, to the disaster event. What possible biases could be introduced by this strategy for the estimation of risk? Some possibilities include the following: (1) Individuals who developed PTSD may be more likely than noncases to recall exposure to disaster (i.e., to label such events as disasters). If so, the relation between exposure and PTSD will be overestimated, that is, will appear stronger than it truly is. (2) Individuals treated in a private psychiatric facility may be of a higher socioeconomic status than the community population as a whole. In turn, higher socioeconomic subgroups may have been buffered against the most stressful aspects of the disaster (e.g., they may live in well-fortified houses rather than trailers, they may have greater financial resources to draw upon for recovery from losses, etc.). If so, analysis of these cases and noncases will yield results that underestimate the relation between PTSD and disaster. (3) If the retrospective study is conducted several years after disaster impact, existing cases of PTSD are not representative of all incidence of PTSD following the disaster, since some PTSD cases may have moved, recovered, or died. For example, those with the most severe manifestations of PTSD could be unrepresented as a result of their possibly higher than average mortality from suicide, alcoholism, and the like. Loss to the study of such individuals may again yield an underestimate of the relation between PTSD and disaster exposure. As this example illustrates, obtaining access to cases and noncases that are representative of the disaster population at large may pose an insurmountable problem for retrospective clinical investigations, making it impossible to generalize the results beyond the study sample.

Another methodological hurdle for clinical investigations is the lack of an agreed-upon definition of what constitutes a case of PTSD. As noted in the earlier discussion of types of response, the definition of the disorder is still evolving. Although a revision of the DSM-III diagnosis of PTSD was recently published (APA, 1987) many of its features remain controversial. For ex-

ample, the disorder is tied to "an event out of the range of usual human experience . . . that is psychologically traumatic," but it is unclear what types of experiences qualify for this definition. Further, it is not clear who must be able to make the link between the stressor and the symptoms: the respondent or the clinician. Instruments requiring that the individual be able to make this link may result in underreporting of the syndrome, in cases where symptoms of denial and numbing are predominant (Green, Lindy, & Grace, 1985). A related controversy is over the criterion that symptoms of intrusiveness and numbing co-occur within the same 6-month time period. The research of Laufer, Brett, and Gallops (1984) suggests that either a pattern of reexperiencing or one of denial will dominate the symptom picture, depending on the nature of the traumatic event. If their findings are correct, instruments that require simultaneous presentation of these symptoms for a diagnosis of PTSD may also underreport cases.

In addition to facing definitional problems, clinical studies of post-traumatic stress disorder must contend with issues of the timing of measurement. If Horowitz's (1976) view of the disorder as cyclical is valid, the symptom picture may substantially vary according to when the assessment is made. Further, assessment itself may activate otherwise quiescent symptomatology, and/or the PTSD syndrome may be delayed in expression (Green, Lindy, & Grace, 1985). Thus the nature of the disorder may, in itself, diminish chances of reliable and valid assessment.

SOLUTIONS. There are no easy solutions to the problems associated with the conduct of clinical investigations. Given the difficulties associated with obtaining representative samples of cases with and without exposure to trauma, this methodology is not well suited to obtaining direct estimates of risk. Even within highly circumscribed subpopulations, the limits on generalizability are difficult to ascertain.

Instead, case-control studies are better applied to the explication of the clinical syndrome, through studies that explore PTSD's diagnostic specificity, symptomatology, course, and co-occurrence with other mental disorders. The definitional problems associated with identifying cases of PTSD suggest the need for research with nosology and clinical course as the focus. Evidence, primarily from studies of Vietnam veterans, suggests that individuals with PTSD typically also have at least one other diagnosis, such as substance abuse, depression, anxiety, and/or antisocial personality (Bou-langer & Kadushin, 1986; Green, Lindy, & Grace, 1985). Apart from the etiological criterion, many of the specific symptoms of PTSD overlap with other disorders, indicating the need to more explicitly determine symptoms, physiological markers, and patterns of expression that distinguish this disorder from others of common co-occurrence.

An example of a clinical study that moves the field in this direction is the one by Malloy, Fairbank, and Keane (1983), who used case-control methodology to compare PTSD veterans, well-adjusted veterans, and matched

psychiatric controls in terms of their psychophysiological reactivity to combat sounds versus neutral stimuli. Both these investigators and an independent research team (Blanchard, Kolb, Pallmeyer, & Gerardi, 1982) found PTSD veterans to differ from the control groups in terms of higher baseline heart rate and greater cardiac reactivity to combat stimuli. Given the controversy surrounding the diagnosis of PTSD in veterans (see Sierles, Chen, McFarland, & Taylor, 1983) and in victims of other events where litigation is a possibility, the discovery of a reliable, non-self-report assessment of the disorder is of great potential utility (Blanchard, Kolb, Gerardi, Ryan, & Pallmeyer, 1986).

The methodological problems posed by fluctuations in the diagnosis can only be addressed by repeated assessments (Green, Lindy, & Grace, 1985). Cases and controls, although identified retrospectively with respect to the event, must then be followed prospectively to assess patterns in expression of the disorder over time. Both PTSD cases and controls may be victims of the same disaster, yet have had very different experiences and symptom patterns. For example, it might be retrospectively determined that early identified PTSD cases were more likely than victim controls to have been bereaved or exposed to the grotesque. Repeated assessments over time would then permit answers to such questions as whether the control victims included delayed cases of PTSD, and/or whether individuals failed to be identified as PTSD cases because they were in the disorder's denial phase at the time of initial assessment.

Process Studies

For some investigators the key question is neither the impairment rate (how many?) nor the diagnosis (what form?), but rather the causal explanation of disaster's impact on mental health (why?). This third kind of risk factor study focuses on the development and testing of a conceptual model of the disaster-response syndrome. Emphasis in these designs is given to consideration of individual differences in response to exposure. Theoretically important mediators assume a central role in the identification of the comparison samples, groups selected by virtue of their ability to operationalize the conceptual processes of interest.

The earlier described work of Baum and his colleagues exemplifies this approach (Baum et al., 1983). Instead of comparing disaster experiences in totally objective terms (e.g., flood versus dioxin exposure, level of damage, etc.), this work translates disaster events into psychologically meaningful terms and designs studies to compare conceptual differences in experience. Noting that human-made disasters appear to induce greater psychological distress than natural catastrophes, Baum et al. hypothesized that human-made disasters pose a greater disruption of our perceptions of control, "in that they represent a loss of control over expectedly controllable technology as opposed to a lack of control over natural disasters never perceived as controllable (Baum et al., 1983).

Baum and colleagues have explored these ideas with different victim populations, but most thoroughly with the victims of the Three Mile Island (TMI) nuclear reactor accident. For example, one study compares victims and nonvictims with respect to the way in which they explain the TMI event and assesses the relation between these explanations and measures of stress. Speculating that self-blame for problems following the TMI accident would lead to enhanced perceptions of control, these investigators found that victims who assumed some blame for their troubles exhibited fewer symptoms of stress than did victims who assumed no responsibility (Baum et al., 1983). These investigators are now engaged in a program of research to assess whether disasters that are relatively more disruptive to perceptions of control (i.e., technological hazards) cause more distress even when other dimensions of the event are held constant (e.g., duration).

The work of Baum and his associates, as well as that of other psychologists studying stress (e.g., Lazarus, 1966; Slovic, Fischhoff, & Lichtenstein, 1981) tends to emphasize the victim's subjective interpretation or appraisal as the most significant mediator of the stress-response syndrome. As noted earlier in this chapter, many other, more objective, factors can also mediate individual response to disaster. Several investigators have elaborated complicated process models of the disaster-response syndrome that attempt to diagram the interrelations of as many mediators as possible in predicting individual outcomes (see, for example, Cohen & Ahearn, 1980, pp. 36-41). However, whether simple or complex in nature, subjective or objective in emphasis, process models provide a theoretical basis for the design and analysis of disaster data.

ADVANTAGES. The process model approach to risk factor investigation offers several advantages over the population-based and clinical strategies. Because they are guided by theory, process models can be more parsimonious than population-based studies in the number of questions asked of respondents. Similarly, because the comparisons are planned a priori, fewer respondents need to be interviewed to achieve required cell sizes. Thus process studies tend to be considerably less expensive to conduct than population-based investigations.

The process model approach also avoids the PTSD definitional problems encountered by the other two risk factor approaches. Because population-based studies are primarily concerned with impairment rates, and because clinical studies identify comparison groups in terms of cases and noncases, both of these approaches rely on arbitrary and shifting definitions of disorder that may subsequently impede cross-study comparisons of findings. Process models have greater flexibility in selecting from among a range of outcomes and may therefore express findings in terms of degree of impairment (number of symptoms) and/or type of behavioral dysfunction, rather than in terms of rates of disorder.

Finally, because causal relationships are theoretically defined and pre-

dicted prior to data collection, this research strategy avoids the statistical pitfalls posed by too rich data (see the earlier discussion of population-based studies). That is, because the comparisons are planned in advance and limited in number, the investigator has greater confidence that a given finding represents an actual difference, rather than a statistical artifact.

PROBLEMS WITH THE PROCESS MODEL APPROACH. Although process models attempt to answer the question of why some victims suffer particularly negative effects from disaster, many researchers would argue that these studies are in fact descriptive rather than explanatory. Because naturalistic studies do not use random assignment in determining victim and control groups, the casual direction of any found association cannot be established. Process studies relying entirely on cross-sectional data are therefore especially vulnerable to this attack.

To illustrate, suppose an investigator wishes to explore the role of social support in victim response, and finds that his or her results confirm the prediction that lower levels of social support are associated with higher reported stress following disaster. Although the investigator may wish to conclude that predisaster social support acts as a buffer against disaster-induced stress, he or she cannot confidently make this inference. An alternative explanation is that poorer adjustment and lack of support are the result of social incompetence, a preexisting characterological deficit of the individual unrelated to disaster exposure. Another explanation is that the obvious suffering of a disaster victim creates feelings of vulnerability and inadequacy in others, causing them to turn away from the victim. In other words, it is not known whether disaster affects levels of social support, preexisting social support affects postdisaster adjustment, or both adjustment and support are affected by some third, unassessed factor.

Another disadvantage of process model studies is one shared by the clinical approach: it is difficult to assess the extent to which the study sample is representative of, and therefore generalizable to, the entire victim population. Because population-based studies are concerned with rates of impairment, samples are selected on a random (or stratified random) basis, allowing for direct estimates of risk in the victim population. In contrast, process models are concerned primarily with internal validity and are likely to select samples from subpopulations of particular theoretical importance (e.g., the bereaved or hospitalized). The lack of generalizability of these studies impedes the ability to compare findings across diverse study populations.

Finally, process models that attempt to specify the nature and causal direction of all possible disaster characteristics, reactions, consequences, and mediators, are too complicated to be subjected to a single test. The primary effect of such configurations may be to discourage investigators from considering disaster as a topic of research. However, as Elliott and Eisdorfer (1982) note in their discussion of stress:

Such an ever-changing, interlinking system is not only difficult to describe but also impossible to study in its entirety. For this reason, investigators inevitably try to simplify the system as much as possible by studying one small portion at a time. It is vital to remember that such studies are only partial approximations of what actually occurs. (p. 23)

SOLUTIONS. Although random assignment is not an option available to naturalistic studies of disaster, causal inferences may yet be drawn from process studies that employ longitudinal, prospective designs. Particularly strong in this regard are studies that incorporate predisaster and/or collateral measures of the outcomes, predictors, and mediators of interest. Already mentioned in the discussion of population-based studies are archival measures that may be used to validate self-reports of functioning before and after disaster impact (e.g., systolic blood pressure, school attendance, mental health visits; see Baum, Grunberg, & Singer 1982, for an in-depth discussion of this issue). In population-based studies, where the focus is on impairment rates, verification of exposure and outcomes may be sufficient. However, in process studies mediators assume a key role, and efforts to provide collateral and/or baseline assessments of these factors may also be required for causal inference. For example, investigators studying the mediating effects of social networks may wish to interview not only victims but also members of the victims' social networks, regarding the nature of interactions pre- and postdisaster (see Sarason, Shearin, Pierce, & Sarson, 1987).

Acquiring predisaster information on less objective mediators may require considerable ingenuity. Peterson and Seligman (1987) displayed this ingenuity when they devised a method of content analysis that would allow them to infer characteristic attributional style from any 1,000-word self-referent document. This methodology permits researchers interested in causal explanations as mediators of disaster effects to predict victim responses from any spontaneously written material (e.g., letters, verbatim interviews) generated by the victim prior to the event.

With respect to generalizability, it should be noted that the problem of unrepresentativeness is not truly intrinsic to the process model approach. Given sufficient resources, process studies, like population-based studies, could be designed to include random samples representative of the entire victim population. However, unless the goal of the research is to determine rates of impairment, such an approach is not cost-effective; causal relationships can be explored with much greater parsimony by sampling from comparison groups most illustrative of the concepts under investigation. If the sample is representative of the subgroup (e.g., a random sample of the bereaved), the results may be generalized to other victims fitting the same subgroup criteria.

Concluding Remarks about Risk Factor Studies

The above discussion distinguishes among population-based, clinical, and process model studies of risk factors in an effort to highlight the purposes,

strengths, and problems associated with each strategy. To some extent these distinctions have been overdrawn; in practice, there is considerable overlap among these approaches. For example, there is nothing to prevent a population-based study from *a priori* specification of a theoretical framework and related hypotheses, or from the analysis of results in terms of symptoms as well as diagnoses. The distinctions among the three types of risk factor studies are drawn primarily to illustrate the kinds of trade-offs that must be considered in making choices about various aspects of the design.

Intervention Studies

After risk factor studies have isolated the mental health consequences of different kinds of disaster experiences and identified high-risk victims, researchers must evaluate the various prevention and treatment options available to those in need of formal intervention. Many of the methodological issues raised in the discussion of risk factor studies also apply to evaluations of interventions. However, studies of formal disaster interventions also pose additional challenges to disaster researchers. Although not intended to be exhaustive, this section discusses some methodological considerations of particular relevance to the design of evaluations of interventions.

Three basic approaches are available for evaluating formal interventions for disaster-induced mental health disorders: controlled *clinical trials*, *field studies*, and *quasi-experimental designs*. The following discussion highlights methodological strengths and problems associated with each of these approaches.

Controlled Clinical Trials

Although random assignment of individuals to disaster events is an impossibility, random assignment of victims to interventions may be a viable option. From a scientific standpoint, randomized clinical trials (true experiments) are the method of choice in studying intervention effectiveness. However, the appropriate use of this methodology presupposes that a disordered population has already been identified by some uniform criterion. Individuals meeting this criterion are then randomly assigned to an intervention group, a no-intervention group, or other comparison group.

In comparing the outcomes of two or more groups, it is imperative that these groups not differ systematically prior to the experimental intervention. When sufficient numbers of individuals are included in the study, the random selection procedure ensures that the intervention group does not differ from the control group in terms of, for example, extent of harm, preintervention psychopathology, socioeconomic status, or any factor likely to affect outcomes other than the intervention itself (see Cook & Campbell, 1979). The strength of this approach is well recognized: a true experiment permits direct inference of cause and effect. Thus, investigators using this method can assess the extent to which a given technique (e.g., drug therapy) is successful

in reducing or preventing long-term PTSD symptomatology, relative either to an alternative treatment (e.g., crisis counseling) or to a no-treatment control condition.

Unfortunately, the drawbacks of a true experiment will, in many cases, preclude the use of this method for assessing intervention effectiveness. Clinicians often express strong reservations about withholding (or delaying) treatment from individuals in immediate need of assistance. Some of these reservations may be removed by eliminating the no-intervention control group and designing the study as a comparison of two competing techniques. Given the current state of knowledge about interventions for PTSD, controlled clinical trials may be readily justified when used in this way. Comparative outcome studies on psychotherapeutic approaches to PTSD have not yet been published; the literature is still largely in the case report stage (for a review, see Ahearn & Cohen, 1984). Because it has not yet been established which, if any, of the existing therapies is effective in the treatment and prevention of post-traumatic stress disorder, random assignment of victims to two different interventions, or even to a no-intervention control group, is an ethically defensible procedure (see Saxe & Fine, 1981, for an in-depth discussion of ethical issues involved in intervention studies).

In practice, however, random assignment is likely to face opposition from clinicians who, even without supportive research evidence, feel they have a therapeutic technique of particular value to individuals suffering from posttraumatic stress. Another likely obstacle to random assignment is presented by the victims themselves, who may refuse to consent to one or another intervention technique. This kind of self-selection introduces undetectable sources and amounts of bias, thereby preventing estimation of intervention effects.

A variation of clinical trials augments that random assignment process with matching. Instead of allowing chance to minimize differences between the intervention and control groups, the investigator identifies pairs of subjects matched, for example, in terms of severity of impairment, duration of disaster exposure, and key experiences such as bereavement. Each pair is then randomly assigned to either the intervention or control condition. In this way, important differences between the subject groups are held constant, so as to minimize extraneous sources of variability that might obscure differences in intervention outcomes. Matching does not solve the access problems described earlier. On the contrary, in some cases it may be more difficult to get the kind of cooperation needed for matching than for simple random assignment, in that matched pairs are harder to locate. However, matching offers the advantage of reducing the number of participants needed to test for intervention effects.

The preceding discussion is predicated on the assumption that the investigator has ready access to a substantial population of traumatized victims who are amenable to mental health assistance. Few disasters provide this kind of opportunity for research. Perhaps for this reason, most case studies

of PTSD treatment have been done on Vietnam veterans. Because this population is large, and because veterans are largely restricted, for reimbursement reasons, to the use of Veterans Administration (VA) hospitals for treatment of their mental health disorders, researchers within the VA have unusual access to large numbers of cases of PTSD. Even under these circumstances, treatment studies of VA patients have limited generalizability; cases presenting themselves for treatment are a self-selected group whose PTSD symptomatology (and therefore response to treatment) may not even be representative of Vietnam veterans as a whole, let alone of victims of other traumatic events.

Another problem potentially restricting the generalizability of clinical trials lies in the nature of the instruments employed. Most risk factor studies rely on structured survey instruments administered by lay interviewers. In contrast, clinical studies, particularly of intervention effectiveness, are more inclined to use open ended, in-depth interviews conducted by expert clinicians. Such interviews, often psychodynamic in orientation, may assess not only symptomatology, but also family history, early memories, personality structure, and so forth. Green (1982) notes that the in-depth interview, by its very nature, is likely to include the development of at least a temporary, semitherapeutic involvement of the diagnostician with the victim. In other words, even the no-treatment control group may be receiving a brief intervention not characteristically experienced by the untreated victim population. Although demand characteristics (i.e., changes in the phenomenon resulting from the act of measurement itself) are a potential problem in any experiment, their influence may be of particular concern in studies of intervention effectiveness. One way of assessing the effect of the in-depth interview would be to include a structured symptom checklist and to incorporate an additional no-treatment control group for administration of the checklist measure alone. Use of this checklist would also facilitate comparisons of the study findings with those of other disaster investigations.

Field Studies

Given the practical difficulties involved in arranging for randomized assignment of victims to treatment and no-treatment groups, investigators interested in studying interventions for PTSD and other disaster-induced psychiatric disturbances may be compelled to conduct naturalistic studies. Similar to the population-based study of risk factors, this approach involves tracking disaster victims over time; in this case, however, the long-term impairment rates of persons who seek formal assistance are compared with the rates of the ones who do not. The field study uses statistical analysis, rather than random assignment, to control for important preintervention differences.

In addition to sharing all the difficulties already discussed for population-based studies, the intervention field study also faces a major set of problems resulting from the general unwillingness of disaster victims to seek formal assistance for mental health problems (see Solomon, 1986). This reluctance

translates into a need for extremely large sample sizes, because an investigator will need to follow several hundred victims in order to locate enough formally treated individuals to permit a test of intervention effects. In addition, victims are likely to seek treatment from diverse providers, rather than to use a single mental health resource. The relatively few who do seek mental health assistance may be very different from disturbed victims who avoid such services. Although some important differences between treated and untreated victims can be controlled for in the statistical analysis (e.g., level and type of impairment), other unassessed differences may still be present. Finally, respondents may underreport utilization of mental health services, due to the associated stigma.

Combining the Field Study with the Clinical Trial: Quasi-Experimental Designs

The above problems may defeat the utility of using the field study as a method of investigation of intervention effects. In some cases, a quasi-experimental approach, combining elements of both the field study and the clinical trial will be the most feasible research strategy. For example, an investigator could use field study methods to identify victims at highest risk for psychopathology, either in terms of the severity of their disaster experiences (e.g., injury, bereavement, permanent relocation) or in terms of reported levels of psychiatric disturbance. A variety of active outreach strategies could then be targeted toward these high-risk victims (e.g., media announcements, community case-finding, special efforts to reach specific groups, telephone contact; see Lindy, Grace, & Green, 1981). Individuals reached by these different methods could be referred to a particular mental health provider, who would then randomly assign victims to either of two intervention models. Because the number of victims presenting themselves for assistance is likely to be small, between-group differences could be minimized by matching victims according to levels of impairment and/or outreach strategy, prior to random assignment. This research strategy would allow for many levels of assessment within a single project: risk factor assessment, assessment of outreach efficacy, and assessment of the effectiveness of the prevention intervention. By structuring the project in this fashion, the effects of pre-dispositional factors, disaster experiences, and the interventions themselves could be readily distinguished, eliminating problems of confound typically encountered in field studies of formal interventions. Further, the design would permit comparisons of the long-term outcomes of high-risk victims who received treatment with the outcomes untreated individuals also identified as high-risk by the initial field study.

Problems and Opportunities for Studies of Disaster

Some issues transcend the substantive nature of any disaster research. Whether a study of risk factors or one of intervention effectiveness, any investigation

of disaster effects must struggle with the problems of access to victims, of human subjects' protection, of instrument validity, and of timing of measurement. Although some of these issues have already been mentioned in the context of particular research strategies, their importance suggests the need for further comment.

Access to Victims

Gaining access to disaster victims may be the greatest practical problem encountered by any study of disaster. Occasionally the investigator will be able to directly approach potential respondents, either by media announcements or by canvassing affected neighborhoods. More commonly, however, it is necessary to work through an agency with the ability to identify victims of disaster. For example, technological hazards such as toxic contamination often provide little visual evidence of damage. Victims themselves may be unaware of exposure until so advised by the government or media. An investigator wishing to enumerate these victims for sampling purposes may need to work with government organizations that have objective information about areas of exposure, such as the State Department of Health, the Environmental Protection Agency, or the Centers for Disease Control.

In cases of natural disaster, the impact of exposure may be highly visible. However, such disruptive events are likely to cause substantial dislocation of victims, and the cooperation of a victims' assistance organization like the Red Cross may be essential for locating victims in high-impact areas. Wortman et al. (1980) offer excellent practical advice on establishing a sound relationship with agencies who work with victimized populations. They note the importance of the following steps: learning about the organization, identifying key personnel, familiarizing agency staff with the project's purpose and potential benefits, enlisting agency advice and input, alleviating any potential staff burden caused by the project, and obtaining a written legal agreement that enumerates mutual responsibilities (see Wortman et al., for a detailed discussion).

Success of the project depends not only on the cooperation of victim assistance organizations but also on the cooperation of the victims themselves. Wortman et al. (1980) suggest that high respondent commitment is most likely to be obtained when the research team includes interviewers selected for strong social skills and similarity in background with the respondents. The purpose and importance of the project should be explained to respondents in sufficient detail so that they understand the potential benefits of the study both to society and to themselves (e.g., the possibility of improving intervention techniques of subsequent benefit to the victim, the opportunity to talk to a sympathetic listener, the opportunity for intellectual stimulation, the opportunity for financial remuneration). If initial participation is rejected, the interviewer should find out the victims' reasons, since many who refuse may be willing to be contacted at a later date (Wortman et al.)

Protection of Respondents

Respondents may be enlisted through a variety of means, but participation should not be secured without concern for victims' problems and needs. Investigators must guard against the use of enlistment procedures that border on coercion. They should also be sensitive to the practical problems and emotional distress of victims in the period immediately following disaster impact. Initial contact should be postponed until acute distress has subsided, and victims are able to make a reasoned choice about study participation (cf. Wortman et al., 1980).

Investigators must also carefully consider the potential impact of the interview questions. By their very nature, disaster studies are designed to explore mental health responses to a traumatic event. Answering questions about this kind of experience may be very stressful for certain victims; even interviews administered long after the event may reactivate otherwise quiescent psychiatric symptomatology. Thus, human subject protection procedures that are standard for other kinds of investigations (e.g., obtaining prior consent, assuring confidentiality, advising subjects of potential risks and of their right to terminate the interview at any time) may be insufficient for studies of traumatic events. Investigators must thoroughly pilot their instruments to identify and eliminate questions likely to induce negative psychiatric consequences. They must train their interviewers to recognize unusually negative reactions to particular questions and provide them with procedures for dealing with such distress. For example, interviewers may need to remind respondents of their right to refuse to answer upsetting questions. Investigators should also ensure that access to immediate clinical help is available and that interviewers make respondents aware of this opportunity. Finally, all respondents should be given a telephone call by a study representative on the evening following the interview to determine whether they are experiencing any negative aftereffects requiring a clinical referral.

Instrument Validity

Like problems of access and respondent protection, issues of validity also transcend the particulars of any research effort. As noted earlier, collateral and/or archival data may be used to validate self-reports of disaster exposure, as well as of functioning before and after impact. However, multiple assessments of the same factor may confront the investigator with the problem of how to handle discrepant information. For instance, the aforementioned study of disasters in St. Louis, Missouri, used government records to identify victims exposed to radioactive contamination of wells (Smith et al., 1986). Despite widespread media attention to the problem, however, few objectively identified victims reported exposure to contaminated well water. Because the accounts of actual and perceived exposure disagreed, researchers were confronted with the problem of deciding which measure to use as the

basis for defining victim status (see Fischbach & Henderson, 1985, for discussion). To take another example, studies of child victims typically ask for both child self-reports and parental assessments of the child's functioning. These studies often find that children report significantly more problems and symptomatology than do their parents (see for example, Handford, et al., 1983). Although this discrepancy is often interpreted as evidence of parental underreporting, the investigator's decision to assign relatively greater validity to the child's responses must be based on judgment rather than on fact.

The issue of validity is of particular importance in the diagnosis of post-traumatic stress. The field presently disagrees about the disorder's defining characteristics, about the cyclical course of symptomatology, about the ability of the victim to link symptomatology to the traumatic event, and so forth (see Boulanger, Kadushin, Rindskopf, & Carey, 1986, and previous discussion). Consequently, existing instruments measure PTSD in markedly different ways, resulting in different rates of impairment in victim populations (Green, Lindy, & Grace, 1985). Many of these scales have been subjected to little or no assessment for reliability and validity. Given the nascent state of the art in PTSD measurement, investigators interested in determining case status may wish to incorporate three of the more extensively studied scales and define case status on the basis of a positive score on two of the three measures (see Dohrenwend & Shrout, 1981). A similar tie-breaking strategy may be used to resolve other discrepant findings (e.g., using teacher reports to resolve differences in the rates of dysfunction reported by child victims and their parents).

Timing of Assessment

The timing of the interview also affects the meaningfulness of the resultant data. Measuring victim reactions in the immediate aftermath of a disaster is questionable not only from an ethical standpoint, but from the standpoint of accuracy as well. Even if they agree to participate, individuals in acute distress are unlikely to provide complete and well-considered responses to research questions while preoccupied with concerns about shelter, transportation, and/or safety of family members. However, even if immediate assessment were desirable, it is seldom feasible given the earlier noted difficulties in gaining access to victims.

Indeed, initial assessment is more likely to take place too late in the disaster-response process than to occur too early. As Green (1982) notes, timing of assessment is often dependent on practical considerations rather than on scientific ones. Uppermost among practical constraints are the ones imposed by funding; delays in funding typically prohibit assessment of early responses. The NIMH, for example, has a 9-month grant review cycle, from time of submission to earliest possible award. The time involved in preparation of a detailed application, as well as that involved in addressing requests by peer reviewers for greater specificity, can add substantially to this 9-month time frame.

Although the length of the review process may be appropriate for other study topics, it effectively eliminates the possibility of funding studies that require the assessment of early responses to particular disaster events. Because of this problem, NIMH grant applicants are encouraged to focus their research on a particular mental health issue, rather than on a particular emergency event, thereby allowing for review, approval, and funding prior to the disaster. This review process acknowledges that, although the exact location and timing of a particular disaster cannot be predicted, the overall occurrence of emergency events is regular and frequent. Funding prior to the event is intended to allow investigators the opportunity to prepare for such events by completing the design of measures, designing analytic and sampling plans, training interviewers, and pilot-testing instruments in areas of high risk. Examples of NIMH grants that have successfully used this approach include one awarded to Peter Steinglass of George Washington University in Washington, D.C., for the study of family response to disaster-initiated relocation, and one awarded to Leonard Bickman of Vanderbilt University, Nashville, Tennessee, for the study of help seeking in the wake of disaster. In both cases, these investigators were given advance financing so that they would be prepared to begin data collection soon after disaster impact.

For important and unanticipated disasters, advance preparation is, of course, impossible. For this reason, NIMH also contributes funds to the National Science Foundation's rapid response program at the University of Colorado. This program is designed to cover nominal data collection and travel expenses for investigators desiring immediate access to a disaster site. Although the rapid response program is not designed to cover salaries, it does provide the investigator with early entry into the field, thereby allowing time for the preparation of a full-blown research application.

From a scientific perspective, early and repeated measurement is essential for understanding the course of responses to traumatic stress. Early assessment permits specification of the link between the event and patterns of acute symptomatology. Repeated, long-term measurement is needed to determine which aspects of the event and/or personal characteristics lead to chronic disorder and to ascertain whether patterns of symptomatology continue to be tied to specific environmental stimuli or instead take on a life of their own (Green, Lindy, & Grace, 1985).

CONCLUDING COMMENTS

This chapter highlights some important methodological considerations in the design of psychosocial studies of disaster. Disaster mental health is a relatively new field of research; only within the last few years have systematic theoretical and empirical advances been made. As with every important problem, there are several reasonable approaches to its study, not a singular

right one. Applied research always involves a tension between practical and scientific concerns: between available resources and project goals, between empirical comprehensiveness and theoretical relevance, between standardization of instruments and their continued refinement, between research requirements and victim needs.

The foregoing discussion indicates some of the important trade-offs an investigator must make in choosing one research strategy over another. There are no easy answers; each problem may be investigated in a variety of ways, and the optimal strategy will depend on the host of factors unique to each situation. Some situations may be so fraught with practical difficulties that they are simply not amenable to systematic study; disaster investigators must hope for the wisdom to know when this is the case.

Although tests of intervention effectiveness should ideally wait until relevant measures have been perfected and high-risk groups have been identified, they cannot wait. Disasters occur daily, and victims must be helped. And although policy should wait until relevant research has been conducted, neither can it wait. Policy makers are constantly faced with decisions about how to prepare for and respond to disaster events in ways that will minimize long-term negative consequences to mental health. This chapter has outlined important problems likely to confront disaster investigators in the design of different kinds of studies. The highlighting of strategies used by some of the pioneering investigators in this area, may provide clues to the solution of some of these methodological problems. Because disaster mental health research is still in its infancy, many important topics remain unexplored, topics whose investigation will demand creative solutions yet untried. It is hoped that this book will serve to encourage new investigators to take on the challenge of disaster mental health research, for the importance of this work is undeniable.

REFERENCES

- Ahearn, F. L., & Cohen, R. E. (1984). *Disasters and mental health: An annotated bibliography*. Washington, DC: National Institute of Mental Health.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.; DSM-III). Washington, DC: Author.
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed.-Rev.; DSM-III-R). Washington, DC: Author.
- Barton, A. H. (1969). *Communities in disaster: A sociological analysis of collective stress situations*. New York: Doubleday.
- Baum, A. (1986, August). *Toxins, technology and natural disaster*. Master lecture presented at the annual meeting of the American Psychological Association, Washington, DC.
- Baum, A., Fleming, R., & Singer, J. E. (1983). Coping with victimization by technological disaster. *Journal of Social Issues*, 39(2), 117-138.

- Baum, A., Grunberg, N. E., & Singer, J. E. (1982). The use of psychological neuroendocrinological measurements in the study of stress. *Health Psychology, 1*(3), 217-236.
- Berren, M. R., Beigel, A., & Ghertner, S. A. (1980). A typology for the classification of disasters. *Community Mental Health Journal, 16*(2), 103-111.
- Blanchard, E. B., Kolb, L. C., Gerardi, R. J., Ryan, P., & Pallmeyer, T. P. (1986). Cardiac response to relevant stimuli as an adjunctive tool for diagnosing post traumatic stress disorder in Vietnam veterans. *Behavior Therapy, 17*(5) 596-606.
- Blanchard, E. B., Kolb, L. C., Pallmeyer, T. P., & Gerardi, R. J. (1982). The development of a psychophysiological assessment procedure for post-traumatic stress disorder in Vietnam veterans. *Psychiatric Quarterly, 54*, 220-229.
- Boulanger, G., & Kadushin, C. (Eds.). (1986). *The Vietnam veteran redefined: Fact and fiction*. Hillsdale, NJ: Erlbaum.
- Boulanger, G., Kadushin, C., Rindskopf, D. M., & Carey, M. A. (1986). Post traumatic stress disorder: A valid diagnosis? In G. Boulanger and C. Kadushin (Eds.), *The Vietnam veteran redefined: Fact and fiction* (pp. 25-35) Hillsdale, NJ: Erlbaum.
- Burchfield, S. R. (1979). The stress response: A new perspective. *Psychosomatic Medicine, 41*, 661-672.
- Burke, J. D. (1986). Diagnostic categorization by the Diagnostic Interview Schedule (DIS): A comparison with other methods of assessment. In J. E. Barrett & R. M. Rose (Eds.), *Mental disorders in the community* (pp. 255-279). New York: Guilford.
- Cohen, R. E., & Ahearn, F. L. (1980). *Handbook for mental health care of disaster victims*. Baltimore: Johns Hopkins University Press.
- Cohn, V. (1980, June 7). Waste sites may invade water supply, subcommittee told. *The Washington Post, A2*.
- Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design and analysis issues for field settings*. Chicago: Rand McNally.
- Department of Health and Human Services. (1985). *HHS data inventory*. Washington, DC: Author.
- Dohrenwend, B. P. (1974). Problems in defining and sampling the relevant population of stressful life events. In B. S. Dohrenwend & B. P. Dohrenwend (Eds.), *Stressful life events: Their nature and effects* (pp 275-310). New York: Wiley.
- Dohrenwend, B. P., & Shrout, P. E. (1981). Toward the development of a two-stage procedure for case identification and classification in psychiatric epidemiology. In R. G. Simmons (Ed.), *Research in community and mental health* (Vol. 2, pp 295-323). Greenwich, CT: JAI Press.
- Eaton, W. W., & Kessler, L. G. (Eds.). (1985). *Epidemiologic field methods in psychiatry: The NIMH epidemiologic catchment area program*. Orlando: Academic Press.
- Edelstein, M. R., & Wandersman, A. (1987). Community dynamics in coping with toxic contaminants. In I. Altman & A. Wandersman (Eds.), *Neighborhood and community environments* (pp.69-112). New York: Plenum.
- Elliott, G. R., & Eisdorfer, C. (Eds.). (1982). *Stress and human health: Analysis and implications of research*. New York: Springer.

- Erikson, K. T. (1976). *Everything in its path: Destruction of community in the Buffalo Creek Flood*. New York: Simon & Schuster.
- Fischbach, R. L., & Henderson, P. (1985). *Exposure to dioxin and radionuclides in the public water supply: Contrast in community awareness*. Paper presented at the meeting of American Public Health Association, Washington, DC.
- Fleiss, J. L. (1986). Significance tests have a role in epidemiologic research: Reactions to A. M. Walker. *American Journal of Public Health*, 76(5), 559-560.
- Glass, D. C., & Singer, J. E. (1972). *Urban stress: Experiments on noise and social stressors*. New York: Academic Press.
- Gleser, G. C., Green, B. L., & Winget, C. N. (1981). *Prolonged psychosocial effects of disaster: A study of Buffalo Creek*. New York: Academic Press.
- Goldsmith, H. (1955). *A contribution of certain personality characteristics of male paraplegics to the degree of improvement in rehabilitation*. Unpublished doctoral dissertation, New York University.
- Golec, J. A. (1983). A contextual approach to the social psychological study of disaster recovery. *International Journal of Mass Emergencies and Disasters*, 1(2), 255-276.
- Green, B. L. (1982). Assessing levels of psychosocial impairment following disaster: Consideration of actual and methodological dimensions. *The Journal of Nervous and Mental Disease*, 17(9), 544-552.
- Green, B. L., Grace, M. C., & Gleser, G. C. (1985). Identifying survivors at risk: Long-term impairment following the Beverly Hills Supper Club fire. *Journal of Consulting and Clinical Psychology*, 53(5), 672-678.
- Green, B. L., Lindy, J. D., & Grace, M. C. (1985). Post-traumatic stress disorder: Toward DSM-IV. *The Journal of Nervous and Mental Disease*, 173(7), 406-411.
- Handford, H. A., Mayes, S. D., Mattison, R. E., Humphrey, F. J., Bagnato, S., Bixler, E. O., & Kales, J. D. (1983, December). *Three Mile Island nuclear accident: A disaster study of child and parent reaction*. Paper presented at the Conference on Methodological Issues involving the Study of Children and their Families Exposed to Disaster, sponsored by the American Academy of Child Psychiatry and the National Institute of Mental Health, Airlie House, VA.
- Hann, N. (1977). *Coping and defending: Processes of self-environment organization*. New York: Academic Press.
- Helzer, J. E. (1981). Methodological issues in the interpretations of the consequences of extreme situations. In B. S. Dohrenwend & B. P. Dohrenwend (Eds.), *Stressful life events and their contexts* (pp. 108-129). New York: Prodist.
- Horowitz, M. I. (1976). *Stress response syndromes*. New York: Jason Aronson.
- Kahn, H. A. (1983). *An introduction to epidemiologic methods*. New York: Oxford University Press.
- Kardiner, A., & Spiegel, H. (1947). *War stress and neurotic illness*. New York: Paul B. Hoeber.
- Lauffer, R., Brett, E., & Gallops, M. (1984). Post traumatic stress disorder reconsidered: PTSD among Vietnam veterans. In B. Van Der Kolk (Ed.), *Post traumatic stress disorder, psychological and biological sequelae* (pp. 59-79). Washington, DC: American Psychiatric Press.

- Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York: McGraw-Hill.
- Lazarus, R. S., & Launier, R. (1978). Stress-related transactions between person and environment. In L. A. Pervin and M. Lewis (Eds.), *Perspectives in interactional psychology* (pp. 287-327). New York: Plenum.
- Levin, S. S., Groves, A. C., & Lurie, J. D. (1980). Sharing the move—Support groups for relocated women. *Social Work*, 25(4), 323-325.
- Lilienfeld, A. M., & Lilienfeld, D. E. (1980). *Foundations of epidemiology* (2nd ed.). New York: Oxford University Press.
- Lindy, J. D., Grace, M. C., & Green, B. L. (1981). Survivors: Outreach to a reluctant population. *American Journal of Orthopsychiatry*, 51(3), 468-478.
- Logue, J. N., Melick, M. E., & Hansen, H. (1981). Research issues and directions in the epidemiology of health effects of disaster. *Epidemiologic Reviews*, 3, 140-162.
- Malloy, P. F., Fairbank, J. A., & Keane, T. M. (1983). Validation of a multimethod assessment of post traumatic stress disorders in Vietnam veterans. *Journal of Consulting and Clinical Psychology*, 51, 488-494.
- Mechanic, D. (1974). Discussion of research programs on relations between stressful life events and episode of physical illness. In B. S. Dohrenwend & B. P. Dohrenwend (Eds.), *Stressful life events: Their nature and effects* (pp. 87-97). New York: Wiley.
- Meyers, B. A., Friedman, S. B., & Weiner, I. B. (1970). Coping scoliosis. *American Journal of Diseases of Children*, 120, 175-181.
- Mitchell, J. T. (1982). Recovery from rescue. *Response Magazine*, Fall, 7-10.
- Mitchell, R. E., & Trickett, E. J. (1980). Task force report: Social networks as mediators of social support: An analysis of the effects and determinants of social networks. *Community Mental Health Journal*, 16, 27-44.
- Neter, J., & Wasserman, W. (1974). *Applied linear statistical models*. Homewood, IL: Irwin.
- Norris, F. H., & Murrell, S. A. (1987). Transitory impact of life event stress on psychological symptoms in older adults. *Journal of Health and Social Behavior*, 28(2), 197-211.
- Peterson, C., & Seligman, M. E. P. (1987). Explanatory style and physical illness. *Journal of Personality*, 55(2), 237-265.
- Quarentelli, E. L. (1985). What is disaster? The need for clarification in definition and conceptualization in research. In B. Sowder (Ed.), *Disasters and mental health: Selected contemporary perspectives* (pp. 41-73). Rockville, MD: National Institute of Mental Health.
- Rabkin, J. G., & Struening, E. L. (1976). Life events, stress, and illness. *Science*, 194, 1013-1020.
- Robins, L. N., Fischbach, R. L., Smith, E. M., Cottler, L. B., & Solomon, S. D. (1986). Impact of disaster on previously assessed mental health. In J. Shore (Ed.), *Disaster stress studies: New methods and findings* (pp. 22-48). Washington, DC: American Psychiatric Press.
- Robins, L. N., & Smith, E. M. (1983). *Diagnostic interview schedule/disaster supplement*. St. Louis: Washington University School of Medicine, Department of Psychiatry.

- Rossi, P. H., Wright, J. D., Weber-Burdin, E., & Perina, J. (1983). Victimization by natural hazards in the United States, 1970-1980; survey estimates. *International Journal of Mass Emergencies and Disasters*, 1(3), 467-482.
- Roth, S., & Bootzin, R. R. (1974). Effects of experimentally induced expectancies of external control: An investigation of learned helplessness. *Journal of Personality and Social Psychology*, 29, 253-264.
- Sarason, B. R., Shearin, E. N., Pierce, G. R., & Sarason, I. G. (1987). Interrelationships of social support measures: Theoretical and practical implications. *Journal of Personality and Social Psychology* 52(4), 813-832.
- Saxe, L., & Fine, M. (1981). *Social experiments: Methods for design and evaluation* (Vol. 131). Beverly Hills, CA: Sage Publications.
- Sierles, F. S., Chen, J. J., McFarland, R. E., & Taylor, M. A. (1983). Posttraumatic stress disorder and concurrent psychiatric illness: A preliminary report. *American Journal of Psychiatry*, 140, 1177-1179.
- Silver, R., & Wortman, C. B. (1980). Coping with undesirable life events. In J. Garber & M. E. P. Seligman (Eds.), *Human helplessness: Theory and applications* (pp. 279-375). New York: Academic Press.
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (1981). Perception and acceptability of risk from energy systems. In A. Baum & J. E. Singer (Eds.), *Advances in environmental psychology* (Vol. 3, pp. 157-169). Hillsdale, NJ: Erlbaum.
- Smith, E. M. (1984). *Chronology of disasters in eastern Missouri*. (Contract No. 83-MH-525181). Rockville, MD: National Institute of Mental Health.
- Smith, E. M., Robins, L. N., Przybeck, T. R., Goldring, E., & Solomon, S. D. (1986). Psychosocial consequences of a disaster. In J. H. Shore (Ed.), *Disaster stress studies: New methods and findings*. (pp. 49-76). Washington, DC: American Psychiatric Press.
- Solomon, S. D. (1986). Mobilizing social support networks in times of disaster. In C. Figley (Ed.), *Trauma and its wake*, (Vol. 2, pp. 232-263). New York: Brunner/Mazel.
- Solomon, S. D., & Fischbach, R. L. (1986, August). *Control as a determinant of help-seeking following disaster exposure*. Paper presented at the annual meeting of the American Psychological Association, Washington, DC.
- Solomon, S. D., Smith, E. M., Robins, L. N., & Fischbach, R. L. (1987). Social involvement as a mediator of disaster-induced stress. *Journal of Applied Social Psychology* 17(12), 1092-1112.
- Walker, A. M. (1986). Reporting the results of epidemiologic studies. *American Journal of Public Health*, 76(5), 556-558.
- Wortman, C. B. (1983). Coping with victimization: Conclusions and implications for research. *Journal of Social Issues*, 39(2), 195-221.
- Wortman, C. B., Abbey, A., Holland, A. E., Silver, R. L., & Janoff-Bulman, R. (1980). Transitions from the laboratory to the field: Problems and progress. In L. Bickman (Ed.), *Applied Social Psychology Annual* (Vol. 1, pp. 197-233). Beverly Hills, CA: Sage Publications.

DESCRIPTION (INCLUDE STOCK NUMBER, MODEL/PART NO., ETC.)	QUANTITY REQUIRED	UNIT OF ISSUE	COST	
			UNIT	TOTAL
Purchase: Book Epidemiologic Field Methods in Psychiatry Edited by: William W. Eaton, M.D. and Larry G. Kessler, Ph.D. Source: Academic Press 465 S. Lincoln Drive Troy, Missouri 63379	6		\$44 EA <i>Cost as of 7/21/80</i>	\$264.00

NATIONAL INSTITUTE OF MENTAL HEALTH
DIVISION OF CLINICAL RESEARCH
EPIDEMIOLOGY, EMERGENCY, AND PSYCHOPATHOLOGY RESEARCH BRANCH
EMERGENCY/DISASTER RESEARCH PROGRAM

Research Program Notice

The Emergency/Disaster Research Program of the Epidemiology, Emergency, and Psychopathology Research Branch, is the focal point in the National Institute of Mental Health (NIMH) for support of research projects on the mental health sequelae resulting from exposure to traumatic life crises and catastrophic events, including natural disaster, technological (human-made) hazards, mass violence, accidents, epidemics, forced relocation, and other individual and collective emergency situations.

The Program supports research on the immediate and long-term psychopathological and stress reactions in victims, families and relief workers; individual and environmental risk factors associated with the development of mental and physical disorder; informal support networks and coping mechanisms as mediators of trauma; and effectiveness of formal programs designed to prevent and treat mental health problems. To be accepted for review, applications must: propose a clearly discernable research activity, involving hypotheses generation, testing or other bases for generalizability; articulate clear and direct relevance to the mental health of victims, families and relief workers. Service programs and/or demonstrations are not supported.

Within this context, the Program is concerned with projects with substantive emphasis in any one or more of the following five areas:

1. Assessment of Immediate and Long-term Psychopathological and Stress Reactions in Victims, Families, Relief Workers, and Community Members.
 - o Studies of the type and incidence of mental health disorders resulting from exposure to emergencies
 - o Studies of changes in life functioning and other early behavioral problems following disaster exposure which may or may not lead to a mental disorder
2. Research on Individual and Environmental Risk Factors Associated with the Development and Continuance of Mental and Physical Disorder in Emergency Victims.
 - o Studies of different population subgroups in order to establish differential risk of negative effects
 - o Studies of environmental risk factors associated with emergencies, such as community and agency response, origin, duration, severity and type of emergency event, threat or potential for reoccurrence

3. Research on the Design, Implementation and Evaluation of Mental Health Treatment for Emergency Victims.
 - o Studies of both short-term crisis intervention and long-term mental health treatment for victims of all ages and/or their significant others
 - o Studies evaluating mental health treatment modes designed to avoid burnout or other psychological disturbance among human service personnel working under conditions of extreme stress
4. Research on Prevention of Mental Health Sequelae Related to Emergencies.
 - o Studies of social support systems and coping mechanisms as mediators of psychological response to emergency events
 - o Studies of community programs for reducing or ameliorating emotional trauma and long-term consequences of emergencies
5. Research on Methodologies and/or Techniques Required to Advance Research in the Above Areas.

Unless clearly relevant to mental illness and mental health, the Emergency/ Disaster Research Program does not support basic studies of social organizations affected by emergency conditions, or basic studies of social policy in the area of crisis management. Furthermore, the Program does not support studies of psychiatric emergencies due to substance abuse or major mental disorders.

Prospective investigators are encouraged to contact Program staff for program boundaries and for consultation.

Susan D. Solomon, Ph.D., Research Coordinator
Emergency/Disaster Research Program
National Institute of Mental Health
5600 Fishers Lane, Room 10C-05
Rockville, Maryland 20857
(301) 443-3774

NATIONAL INSTITUTE OF MENTAL HEALTH

General Information on Application for Research Support
(Catalogue of Federal Assistance No. 13.242)

Under the authority of Section 301 of the Public Health Service Act, as amended P.L. 78-410, 42 U.S.C. 241, the National Institute of Mental Health administers the Federal Government's major program of support for research in mental health. An announcement of NIMH Research Support Programs and current special requests for applications are available from the Office of the Associate Director for Extramural Programs, NIMH, 17C-26, Parklawn, Rockville, MD. 20857.

APPLICATION AND REVIEW

Eligible Institution. NIMH research grants are available to any public or non-profit institution such as a university, college, hospital, or community agency, units of State or local government, and authorized units of the Federal Government; and to for-profit institutions and entities.

Applications. State and local government agencies should use form PHS-5161. All other applicants should use form PHS-398 (Rev. 10/79). Application kits are available in university grants offices or from the Grants Operations Section, NIMH, Room 7C-05, Parklawn, 5600 Fishers Lane, Rockville, Maryland 20857. Instructions for applicants are included in the kit.

The signed original and 6 copies (2 if form PHS-5161 is used) should be sent directly to the Division of Research Grants, National Institutes of Health, Bethesda, Maryland 20205.

Grant Review Procedures. Research grants applications are reviewed for scientific and technical merit by an initial review group (IRG), composed primarily of non-Federal scientific experts, and by the National Advisory Mental Health Council. By law, only projects recommended for approval by the Council may be considered for funding. Summaries of IRG recommendations are sent to applicants as soon as possible after the Council has completed its review.

Review Criteria. In the review of research grant proposals, IRGs consider the significance and originality of the research goals; the scientific merit and validity of the specific research plan proposed; the state of knowledge in that field; the feasibility of the research; the competence and dedication to the project of the principal investigator and his or her supporting staff; the adequacy of available facilities; the potential usefulness, generalizability, or heuristic value of the results including the potential contribution to mental health/public health knowledge; provisions for the protection of human subjects; and the appropriateness of the proposed budget for the work outlined.

Council review also involves questions of policy and program priorities.

REvised Schedule

				Group Dates	Board Dates	Beginning Dates
<p>Jan. 10 May 10 Sept. 10</p> <p>for</p> <p>All individual NRSA applications. All new and competing continuation Institutional NRSA Training grant applications. (Individual NRSA applications are not reviewed by Council. Their start dates are therefore approximately 4 months earlier than indicated.)</p>	<p>Feb. 1 June 1 Oct. 1</p> <p>for</p> <p>All new research grant applications, unless specified differently in a Program Announcement or Request for Applications. Excess Development amend and Conference grant applications. New and competing continuation Program Project and Center applications.</p>	<p>Mar. 1 July 1 Nov. 1</p> <p>for</p> <p>Competing continuation & supplemental research grant applications. + Revised New Research Grants + CAREER. Developmental (ICDA)</p>	<p>Apr. 15 Aug. 15 Dec. 15</p> <p>for</p> <p>Small Business Innovation (SBIIR) Program, both Phases. (Phase II applicants must have completed a federal by-funded Phase I project.)</p>	May/June Oct./Nov. Feb./Mar.	Sept./Oct. Jan./Feb. May/June	Dec. 1 Apr. 1 July 1

All applications must be received by the above dates. If the receipt date falls on a weekend, it will be extended to Monday. If the date falls on a holiday, it will be extended to the following workday. The receipt date will be waived only in extenuating circumstances. To request such a waiver, include an explanatory letter with the signed completed application. No waiver will be granted prior to receipt of the application. It is in an applicant's best interest to submit early and avoid the otherwise unavoidable rush associated with announced receipt dates.

*Small grant applications are reviewed five times a year. They may be sent in at any time. Those requesting June beginning dates, however, must be submitted by December 1, and those requesting July/August beginning dates must be submitted by February 1.

Staff Consultation. Potential applicants may seek information and consultation from Institute staff. Names and telephone numbers of relevant staff are included in each announcement or program notice.

Award Criteria. IRG and Council recommendations, significance of the topic under study to announced NIMH priorities, program balance, public health significance, and availability of funds are taken into consideration into determining which projects will be funded.

Period of Support. Applications (except small grant applications) may request support for a period of up to 5 years. A competing continuation (renewal) application may be submitted near the end of an approved period of support to continue a project. A competing supplemental application may be submitted during an approved period of support to expand the scope or protocol of a project during the approved period. Applications for mental health small grants may request 1 year of support and a maximum of \$15,000.

Terms and Conditions of Support. Grant funds may be used for expenses clearly related and necessary to carry out research projects, including both direct costs which can be specifically identified with the project and the allocable portion of allowable indirect costs of the institution.

Grants must be administered in accordance with the PHS Grants Policy Statement, and with the following regulations:

- 42 CFR 52 Grants for Research Projects
- 45 CFR 46 Protection of Human Subjects
- 74 Administration of Grants
- 80 Nondiscrimination under Programs Receiving Federal Assistance through DHHS Effectuation of Title VI of the Civil Rights Act of 1964
- 84 Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance
- 86 Nondiscrimination on the Basis of Sex in Education Programs and Activities Receiving or Benefiting from Federal Financial Assistance
- 91 Nondiscrimination on the Basis of Age in Programs and Activities Receiving or Benefiting from Federal Financial Assistance

Availability of Funds. Availability of funds is determined by annual Congressional appropriation.

EMERGENCY/DISASTER RESEARCH ISSUES;

**A guide to the preparation and evaluation of grant applications dealing
with traumatic stress**

Edited by:

Andrew Baum, Ph.D.

Uniformed Services University of the Health Sciences (USUHS)

Susan D. Solomon, Ph.D.

National Institute of Mental Health (NIMH)

Robert Ursano, M.D.

Uniformed Services University of the Health Sciences

Proceedings of the Workshop on Research Issues: Emergency, Disaster, and Post-Traumatic Stress (September 1987), Uniformed Services University of the Health Sciences, Bethesda, MD.

Introduction

During the fall of 1987, a group of behavioral scientists involved the study of disaster effects and traumatic stress met to discuss a range of issues related to research in these areas. Each participant discussed his or her research and issues pertaining to conduct of research in this area and a series of recommendations were adopted. This document is a report and summary of these discussions, and is intended to identify the central issues and obstacles to the development of research in this area. As such, it should be useful to those planning, evaluating, and funding this research area.

Workshop participants agreed that the field required codification and standardization. This was seen as best accomplished by increased communication among researchers, adoption of standardized assessment batteries and instruments, development and sharing of common-focus studies, multi-site studies, and conceptual development. Though interest in the effects of trauma has been longstanding, the scientific study of traumatic stress is a relatively young field. Development of this field is needed, not so much in terms of devising a new set of methods and theories, but rather in terms of adapting those from other areas of research to the specific needs of traumatic stress studies.

Concern was expressed by participants about the level of support available and necessary for studies of traumatic stress to improve and produce better information about etiology, treatment, and prevention of detrimental mental health consequences. The difficulties in studying trauma, the necessity of doing naturalistic field studies, the problems of trying to apply experimental control to settings that resist this application, and the nascent

quality of underlying conceptual frameworks may contribute to the apparent difficulty in getting research funded. It was felt that if those preparing research proposals and those evaluating and funding them were informed about these problems, better and more stable research support for this emerging area could be developed.

The following discussion is divided into four sections. The first deals with practical problems associated with the nature of the phenomenon under investigation. The second considers conceptual issues associated with defining and classifying disasters along meaningful dimensions. The third section discusses methodological issues, including both measurement and sampling. The last section of the report reflects recommendations for conducting research in this area, as well as for evaluating and funding this research.

Practical Problems

Clearly, the source of most difficulties in doing this research is the nature of the phenomenon under study. Because traumatic events are not predictable, "before-after" assessments cannot ordinarily be done. Further, doing research with people experiencing emotional distress poses ethical problems and complications. Traumatic events do not give warning; disasters strike quickly, allowing the researcher little time even to get to an area much less prepare for a full-blown research effort. Timing is often critical in studying these events, and logistical concerns never imagined by the laboratory researcher can become predominant in a quick, field-based study of a disaster or trauma.

Because this type of research is also not adaptable to a laboratory setting, it must generally be conducted in the field. The practical,

conceptual, and design issues that characterize this kind of field research are myriad. Laboratory settings, however, simply cannot replicate the real-life situation with its actual threat. Some traumatic events are so stressful that there is no way to come close to an analogue. Further, while treatment-seeking populations have much to teach us about responses to catastrophe, many important questions in this area are related to the impact of a range of stressor experiences on a range of individuals, most of whom never seek treatment. Thus, the population under study as well as the phenomena under study are widely dispersed, and must be sought out rather than screened at a treatment facility.

The practical problems with such studies are many. It is extremely difficult to estimate in advance the costs of conducting such a study and the time frame that will be necessary to complete it. Thus, budgets are likely to underestimate costs. Depending on the area of the country in which one is conducting research, cultural differences may play an important role in access to subjects (e.g., no telephones in motels, subjects will not be interviewed on Sunday, etc.). The ability of subjects to understand the goals of the research may vary with education, and in some rural areas, subjects may be suspicious of researchers from the "big city," or may not take seriously specific appointment times or scheduling appointments in advance. Finally, managing travel arrangements and interviewing in the field over time is extremely complicated. The researcher must to some extent be flexible and adaptable to the locale, subjects, and situation. An administrative person who interacts with the university system (travel authorizations, budgets, expense reporting) and plans the practical aspects of the work (car rental, airline reservations, room rental, expense tracking) is nearly always needed. The large amount of time

(and funding) it takes to conduct such a study with its unique logistical requirements must be appreciated.

Conceptual Issues

Theory-driven research, or research which attempts to identify mechanisms, predictors, and mediators of response to trauma, is stronger and more likely to yield interesting or useful findings than is research which is purely descriptive. Not only does theory allow one to focus and refine measurement of the phenomenon of interest, it also guides design decisions about subject sampling, selection of control or comparison groups, and other procedural problems. However, neither the extensive literature on disasters, nor the smaller but growing literature on traumatic stress, provides easily derivable or testable conceptual frameworks. This section addresses some of the conceptual issues that have emerged from previous studies of traumatic stress.

The Dimensions of Trauma

An important aspect of research in the area of traumatic stress is designing and delineating the salient dimensions of the event, or events, to which the subjects/survivors are responding. The meaning to a subject of a particular event may influence the nature and extent of the response. However, it is also the case that certain types or aspects of events are associated with higher levels of symptoms and rates of disorders than other types of events, regardless of individual meaning, suggesting differential pathogenicity of experiences.

Learning which types of experiences are most likely to lead to problems in which groups or subgroups of victims is important for several reasons. First,

some experiences may be preventable. For example, if specific aspects of body handling after air crashes are shown to have negative long-term effects, then clean-up activities following mass casualties might be planned with this in mind (perhaps using trained individuals rather than civilian volunteers for these duties). Further, if we can identify which experiences are most likely to lead to later problems, populations of exposed individuals most in need can be targeted for outreach/intervention, and public education efforts can be aimed at helping people assess their own risk and understand any symptoms that may develop.

In addition, there are implications for treatment. If certain aspects of experiences are associated with more psychological distress, and those who are more distressed are most likely to seek treatment, it is probable that those individuals who show up for treatment have had some of these experiences. Such information would be helpful to therapists in terms of knowing what to look for in patient's experience and what experiences are going to need addressing in the treatment setting.

Finally, the identification of psychologically relevant aspects of disaster or trauma will guide measurement and hypotheses testing. The impact of a given disaster may be viewed as the impact of various parts of the event or consequences of it: terror, loss, inconvenience, bereavement, and helplessness are all parts of victimization, and some aspects may be more or less salient in different events. Study of targeted aspects as well as the overall impact may help to refine our knowledge of the pathological aspects of these events.

For all of these reasons, studies that investigate links between aspects of stressor experiences and later psychological functioning/disorder are

extremely important. In terms of psychiatric nosology as well, experiences which are more likely to be followed by symptoms can and should be delineated empirically.

Conceptualization of the Structure of the Trauma

Researchers in this area often deal with catastrophic trauma as if it were undifferentiated. For example, we talk about earthquakes, floods, fires or war as if they represent equivalent events. In point of fact they are rarely undifferentiated events. Even the most basic term "disaster" has not been adequately defined. One of the most immediate problems associated with the conduct of disaster research in general is the lack of agreement about what constitutes a disaster. A number of typologies and classification systems have been proposed, but further work is needed in conceptualizing and classifying disasters.

In order for knowledge regarding the effects of a disaster to become cumulative it must be possible to compare results from various studies. Wide variation in the types of disasters studied and lack of systematic classification of factors of various components of disaster has made cross-study comparisons difficult. For example, Bromet and Schulberg (1986) note that part of the reason for the extreme difficulty in identifying consistent predictors of mental health impairment following disasters is the fact that the various studies have focused on disasters which are quite different in nature and severity. The problem of comparability is compounded by the diverse methodologies used in these investigations.

Further, DSM-III-R makes a formal distinction between an enduring circumstance (repeated traumatization within the same setting, as in war or a concentration camp) and an acute, discrete event with clearly defined

beginning and ending points. However, in deciding whether the trauma is an acute event or an enduring process, DSM-IIIR is less helpful. Insofar as natural disasters are concerned, some may be very short term and can be categorized as acute events, but many, such as a succession of earthquakes or the leakage of deadly gas from a lake, may occur over a period of days or even weeks and thus become enduring processes. The same, of course, is true of human-made disasters such as Three Mile Island or Chernobyl. The precise point at which the event/process ends and the post-trauma process begins is often less than obvious. This is a critical methodological issue which requires considerable attention prior to attempting to investigate how catastrophic trauma is related to post-trauma adaptation.

Even in most acute events it is often the case that we can and should distinguish both the nature of individual traumas and the differences between them. In the literature on the effects of war it has now become commonplace to talk about war-stress as a concept which encompasses particular types of trauma such as combat, the loss of a buddy, medical personnel stress and the witnessing of and participation in abusive violence. Originally, however, the war experience was thought to encompass only combat experience. The change occurred as function of researchers discovering that there were distinct dimensions to the war experience which were differentially related to post-war outcomes.

Methodological Issues

Although studies of disasters and other traumatic events share the basic methodological concerns common to other field studies, they also must overcome problems unique to this topic. There is a need for well-designed studies which use standardized instruments and data collection techniques, careful selection

and description of victim and comparison groups, and repeated assessment over time. Studies such as these would permit cross-study comparison, replication, and generalization of findings. At present it is difficult to draw valid conclusions regarding the extent of impairment resulting from different kinds of disaster experiences.

Measurement Issues

What data to collect and how to collect it is of course critical for the development and growth of this research field. The use of unstandardized and investigator-developed unique measures, although necessary in some cases, can contribute to low statistical power, wasted study resources, and an inability to compare findings across studies. However, it must also be stressed that uniformity can lead to rigidity and the possible misapplication of standardized instruments. The art of assessment therefore reflects a balance between these two forces. There is no single set of valid measures and procedures in this field. The use of previously developed measures where appropriate, and the application of multi-level assessment of variables for which standardized measures are not appropriate, will strengthen a research design.

Many measurement problems arise when conducting field studies of disaster. First, most traumatic stress studies are post hoc, i.e., subjects were not studied before they were traumatized. A few investigators have been able to acquire pre/post data when a catastrophe occurs in an area where a study is already underway. Sometimes it is also possible to access existing records on victims (e.g., physician, school, hospital), and categorize these data into "before" and "after" measures. For the most part, however, researchers must rely on subject's retrospective reports of functioning over time. Of course, the subject's account of what happened to him/her with regard

to the actual traumatic experience is very important. It may also be possible to supplement this material with corroborating information, for example by showing that the stressor measures relate to other more objectively determined indices such as the relative destruction of various parts of town. Nevertheless, studies which focus on individual differences require knowledge of what happened to a particular subject, and group measures may be of limited interest in studies of this kind.

Other goals, such as maintaining experimenters "blind" with regard to where subjects live or whether they are in the traumatized or control group is usually not possible, since subjects in a comparison group are likely to live in another area. Comparison groups from the same area are likely to contain secondary victims, who will show effects of their own. In addition, diagnostic assessments of post-traumatic stress disorder (PTSD) require knowledge of experiences such as trauma. In studies examining individual experiences, subjects are likely to volunteer information about what happened to them, thus potentially affecting interviewer assessment. For these cases, panel members recommended including stressor measures that are as objective as possible, and psychological status measures that have well-defined criteria so that interviewers do not have to make many judgments. Stressor measures should focus on what actually happened to the person rather than the subject's feelings about what happened, unless emotions are designated as of particular interest (as in some events where objective harm cannot be assessed, as in toxic or nuclear leaks).

Outcome measures. One problem fundamental to disaster research involves defining relevant outcomes. Some researchers in the field maintain that it is necessary to establish the presence of diagnosable psychopathology or

"caseness", in order for disaster to be considered etiologically significant. Others hold that research needs merely to demonstrate that disasters bring about an increase in the prevalence or persistence of symptoms that are, to a greater or lesser degree, present within the normal population. Recommendations about the most appropriate ways of measuring symptomatic outcomes would seem to rest on the resolution of this issue. However, it should be noted that evidence for severe psychopathology has been found to be fairly limited. Recently, a great deal of attention has been focused on PTSD as an outcome measure. The co-morbidity of other disorders with this diagnosis (in particular, alcoholism and depression) mandates thoughtful consideration in research designs.

The use of "homemade" scales should be abandoned in favor of standardized outcome measures. In the past, selection of measurement instruments for disaster studies was problematic, since most of the previous disaster investigators had devised a new questionnaire for each study. Panel members emphasized the importance of using standardized instruments when conducting disaster research, for purposes of cross-study comparability.

To date, few measures have been validated for use in the systematic assessment of psychological trauma. Researchers seeking to assess the aftermath of exposure to highly stressful events have relied upon a wide range of measures to assess psychological functioning. Typically these measures have been psychiatric symptom-oriented, although some researchers have attempted to evaluate social functioning, marital functioning, vocational functioning, changes in attitudes, and biological correlates of exposure. The work of several of the panel members supports the use of a multi-method approach to the

assessment of adjustment; behavioral, psychophysiological, and the measures domains. Clearly subjective measures have been given precedence in the research conducted to date. However, recent studies have demonstrated the value of complementing subjective indices with measures from the biological and behavioral spheres (Baum, Grunberg, & Singer, 1982). These studies have used multi-method assessment both in the field and the laboratory, thus demonstrating the broad-based applicability and feasibility of this approach for the assessment of traumatic response.

To facilitate consistency in the measures used to assess traumatic outcomes, the panel assembled the types of instruments that have been successfully used by researchers in the field. While it is difficult to recommend the use of any specific battery of measures for a given study, the following instruments are worthy of serious consideration when designing a study of the effects of disaster or other traumatic events.

A) Subjective measures of psychological symptoms:

- 1) Minnesota Multiphasic Personality Inventory and the use of its PTSD sub-scale (Keane, Malloy, & Fairbank, 1984).
- 2) Symptom Checklist-90 (Derogatis, 1977).
- 3) Beck Depression Inventory (Beck, 1967).
- 4) Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977).
- 5) Spielberger State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970).
- 6) Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979).
- 7) Mississippi Scale for Combat related PTSD (Keane, Caddell, Taylor, 1985).

8) Zung Depression Scale (Zung, 1965).

B) Diagnostic instruments:

- 1) Structured clinical interview for DSM-III-R (SCID) (Spitzer & Williams, 1985).
- 2) Diagnostic Interview Schedule/Disaster Supplement (DIS/DS) (Robins & Smith, 1983).

C) Family functioning:

Family Environment Scale (Moos & Moos, 1986).

D) Biological measures or psychophysiological measures:

- 1) Physiological reactivity to cues reminiscent of the traumatic event (heart rate, blood pressure, skin conductance, finger temperature) (Blanchard, Kolb, Pallmeyer, & Gerardi, 1982; Malloy, Fairbank, & Keane, 1983).
- 2) Basal levels of corticosteroids and catecholamines (epinephrine and norepinephrine) (e.g. Baum, Gatchel, & Schaeffer, 1983).
- 3) Ratio of cortisol to norepinephrine (e.g., Mason, Giller, Kosten, & Harkness, in press).
- 4) Basal systolic and diastolic blood pressure (Blanchard, Kolb, Pallmeyer, & Girardi, 1982).

E) Behavioral measures:

- 1) Continuous performance tests, tests of attention (Rosvold et al., 1956; Asarnow et al., 1978).
- 2) Information processing assessments (Stroop, 1935; Rey, 1964).

The above instruments are not intended to be exhaustive of all

potentially useful outcome measures. However, the listing contains measures that have been successfully used in past traumatic stress research, and are

generally viewed favorably in the clinical research literature. Acceptable levels of reliability and validity have been demonstrated for many of these measures, a factor that should enhance their acceptance in the mental health research field. Inclusion of these measures in a research protocol would not necessarily preclude the use of other favored or theoretically derived assessment measures selected by the scientist.

In fact, there may be some areas where the field could advance by developing new measures. There are reasons to believe that symptomatic reactions to disasters may vary both over time and across situations. Although the cyclical nature of symptoms may be captured via repeated measurements, their situation-specific (or situationally enhanced) nature is not captured well by most standardized scales. For example, Endler et al. (1976) argued that individuals differ in their proneness to anxiety in different situations. Some may become anxious in interpersonal situations; others, when confronted by physical danger. They argued that trait anxiety scales primarily tap the anxiety that arises in interpersonal situations and are less likely to tap anxieties that arise in novel or physically dangerous situations. Certain situations could reasonably be expected to be more difficult for victims than other situations, and as a result, disaster effects may be underestimated by current methods.

Further, in post disaster study-only designs it may be difficult to disentangle true increases in psychopathology from apparent increases that result from a tendency of those exposed to blame the disaster for difficulties that may actually have predated it. However, studies using the DIS, for example, have shown that this reversal of the sequence of events can be minimized if, rather than relying on global health assessments, the

investigator inquires about specific symptoms and behaviors, and also makes the effort to carefully date the onset of specific symptoms. Specific questions set in a life-history context reduce the halo effect that may arise from the respondents' feeling that the disaster should have caused particular effects.

Stressor measures. Quantifying dimensions of catastrophic experiences is a difficult task for several reasons. First, since each traumatic event differs from other events in important ways, no existing instrument covers all potential aspects. Investigators may have to invent questions to fit the situation. Second, some events are extremely difficult to quantify, since the harm done during the event is not immediately evident. That is, while the damage resulting from an earthquake may be obvious (e.g., loss of a family member, loss of a house, exposure to dead bodies), the damage done by a toxic or nuclear accident (e.g., Times Beach, Three Mile Island) may not manifest itself for years. In the latter case, beliefs and perceptions of harm become crucial, making stressor measures such as proximity to the site imperfect. Third, some aspects of events are more difficult to quantify than others because of their subjective quality or complexity. For example, threat to life is, to some extent, a judgment based on degree of warning, potential avenues of escape, closeness to the death agent, predictability, and so forth. Consistent with Lazarus' (1966) portrayal of stress and coping as a dynamic cognitive and behavioral process, appraisal of an event may vary with the individual, yielding a range of effects from the same experience.

In spite of these problems, traumatic events can indeed be described and classified along dimensions (see earlier discussion). Investigators are beginning to identify aspects of events that are associated with later

symptoms and attempting to look for generic aspects that transcend different types of events. Several suggestions derive from this. First, rather than starting from scratch, the researcher should look for elements that other investigators have explored in other events. It is important that the explored dimensions include those that are highly salient in the particular event under study. Unless already known, open-ended interviews to determine these aspects are warranted. Measurement of stressors should be as objective and as close to the experience as possible. Research has shown that recall of factual information (e.g., such and such happened) can be quite good over long periods of time, while frequency is less well recalled and reliability for aspects requiring judgment is fairly poor.

Measurement of both the intensity and the distinguishing qualitative features of a trauma are necessary to achieve a full understanding of the impact of the trauma on subsequent adjustment. That is, it is necessary to distinguish between the relative effects of differences in degree of traumatization and differences in kind of traumatization. This suggests that both interval scales and qualitative or categorical measures are necessary, since no single measure will suffice to capture the complexity of trauma. In most studies of war, for example, respondents are asked to indicate whether they have been exposed to any of a range of identified trauma experiences and, if so, their degree of exposure to each of the specified events. The individual items are usually part of a checklist, and the frequency of exposure multipliers consist of a series of five point Likert-style scales ranging from "never" to "often."

Frequency multipliers are often highly redundant with event-components of a scale. A scale which captures a reasonable number of the events within a

dimension may actually provide a latent measure of the frequency of exposure to the range of events. With regard to war experience, for example, a respondent who indicates exposure to a broad range of combat experiences is much more likely to have been routinely exposed to these events than a respondent who indicates exposure to only one or two events. It is also possible to identify those experiences which are most traumatic within a dimension, and then weight those events so that not all events have an equal impact on the scale. Here again, the most traumatic events are generally associated with exposure to a greater range of events.

In most cases, scaler measures of particular dimensions are likely to provide better estimates of the relation between trauma and adaptation to the trauma than either nominal or ordinal measures. However, there are some instances in which scaling an experience does not significantly contribute to a better understanding of the relation between trauma and response. Using the war literature again as an example, the loss of a close buddy appears to be an event whose identifiable pathogenic impact is not enhanced by measuring the number of times the event occurs.

The above approach may also be used to explore dose response issues, such as the following: Is there a minimum dose? How large a dose of a particular component of the trauma is required before we see evidence of a pathogenic response to the trauma? At what level do most humans show some evidence of a pathogenic effect of the trauma? At what point is there no additional incremental effect on the pathogenic response to the trauma? And most intriguingly, what is the dose-response pattern over the range of the trauma? Addressing these issues requires the construction of interval level measurement scales suitable for use in analytic models which may contain both

linear and nonlinear terms.

Timing of assessments. Longitudinal studies using repeated measurements are valuable, if not essential, in the study of disaster effects. To date, little is known about the natural course of psychological reactions. Thus, many crucial questions remain: Do mental health effects occur immediately after exposure or are they delayed? How long do these mental health changes persist? Are they constant or do they fluctuate in a cyclical pattern? Whether or not long-term effects are observed may depend on the severity of disaster, length of the followup interval, and the timing of the followup interview. If data are collected only once, the nature of the findings will depend on when the interview takes place.

It is difficult to develop generally applicable recommendations about the most appropriate length for a followup interval; the ideal timing probably varies across settings and across physical agents. For example, in settings where there is a recurring threat of disaster (tornado season, flood season) it seems advisable to conduct interviews both in the midst of that season and during other times of year. In other situations anniversary dates could be important, although depending on the purpose of the study, such dates may be inappropriate for measurement. The ability to identify a return to baseline or presumed pre-trauma levels of functioning can compensate somewhat for the lack of pre-trauma measures and can provide important information about the effects of trauma.

Sampling Issues

This section discusses a range of methodological issues related to locating a study sample, including defining exposure and identifying victims, selecting a valid comparison group, designing a sampling strategy, gaining

access to subjects, and dealing with attrition.

Defining victims and comparison groups. The definition of exposure can be a problem for an otherwise well designed study, as was found in a study of the mental health effects of various environmental hazards (Smith, Robins, Pryzbeck, Goldring, & Solomon, 1986). Although the tornadoes and floods that struck the study area seemed self-evident, difficulties arose when respondents reported they were out of town when the event occurred or their business was flooded but not their residence. A new category (not at home) was subsequently added for those who were away during the disaster or whose primary residence was unaffected.

Toxic disasters present problems in identifying victims that are not usually found in studies of natural disasters. While flood damage can be seen, toxic hazards such as dioxin often provide little visual evidence of damage. Victims themselves may be unaware of exposure until they are notified by officials. One solution in these cases is to add a new category: self-perceived exposure. Of course, this strategy gives rise to additional research questions, such as assessing differences between the objective-exposure and perceived exposure groups. However, these questions can be important ones, particularly if the differences between such groups are small.

Most studies of disaster define the victim sample in terms of the extent to which given individuals personally experience injury or property damage. Many definitions of victimization, however, recognize the broader, collective, context of disaster. Bolin (1985) observed that there are two broad categories of victims. "Primary victims" are those who directly experience physical, material, or personal losses. "Secondary victims" are those who live in the affected area but have no personal injuries or damages. Nonetheless, they may

have witnessed destruction, been subjected to post-disaster economic problems, or been inconvenienced by washed-out roads and bridges. This two-category definition of victimization recognizes that a disaster is more than an individual's life event; it is a community event with the potential to precipitate change and stress among persons suffering no direct damage. Of course, there may be other victims as well (e.g., relief workers, relatives or friends of primary victims) but most research in this area concentrates on these two classes.

In many studies, "non-victim" controls would be better described as secondary victims. Until more is known about the consequences of secondary or indirect exposure across various types of incidents, the inclusion of indirect or secondary victim groups as well as non-victim groups is recommended. Thus, control groups may reflect "less affected" rather than unaffected populations.

This approach to defining victims has disadvantages, however. It will increase difficulties in establishing the equivalence of the comparison groups in ways other than exposure to disaster. For example, if Cincinnati were to be hit by a tornado, and if residents not personally experiencing property damage were considered as secondary victims, who would be an appropriate non-victim group? Residents of Dayton? Louisville, perhaps? At Three Mile Island, researchers were forced to go beyond nearby communities using areas of 80-100 or more miles away as comparison sites (e.g., Baum, Gatchel, & Schaeffer, 1983; Bromet, 1980). Behavioral scientists, in particular, may find that they need to increase their knowledge of other disciplines, such as demography or economics, to make such decisions. It may be that more than one non-victim site is needed, particularly when pre-disaster conditions are not known and cannot be controlled for in the analysis. Thus, for example, in studies at TMI

a variety of control groups have been used, including people living near undamaged reactors, near traditional plants, or near no power plants, allowing for control of a number of variables.

Since few investigators are in the position of having pre-disaster information on victims, several comparison groups may be needed. Identifying an appropriate control group can be fraught with difficulties. In trying to choose controls as similar as possible to disaster victims in all respects except for the experience of the disaster, individuals from the same area with minimal or indirect exposure to the disaster may be included in the control group. However, individuals only indirectly exposed to disasters (e.g., only vicariously via experiences of relatives or close friends) may exhibit adverse psychological experiences not shared by those never exposed and may, therefore, not be a suitable comparison group. Also, it can be argued that the effects of technological disasters may be widespread with respect to confidence and perceived control.

While those indirectly exposed may be more similar to the disaster victims, individuals without any exposure may differ in ways which are related to their mental health status but are independent of their disaster experience. Exposure to disaster is not an entirely random occurrence, and disaster victims may start out with a higher risk of developing mental problems. Population and economic pressures may cause people to live in marginal or vulnerable areas, predisposing them to victimization.

The use of traditional sampling techniques may not be possible in disaster studies and in fact may not be necessary if the investigator is not attempting population estimates. Because the prevalence of mental health problems in untreated populations is known to be low, sampling from high-risk

groups actually enhances the investigator's ability to detect significant disaster-related effects. However, it must be recognized that compiling a proper sampling frame and obtaining the cooperation of participants in high risk cohorts can be more difficult than in general population surveys. Because of the difficulties (and costs) involved in obtaining suitable comparison groups investigators should consider other sources of data as well. One source is the Epidemiologic Catchment Area (ECA) project funded by NIMH which provides longitudinal data on the incidence and prevalence of psychiatric disorders in five sites across the country. These data are now available for public use. Investigators using the DIS or DIS/DS on a sample exposed to disaster in a demographically similar community could use ECA data and would not need to collect longitudinal data on a "no exposure" control group.

Access. Obtaining access to victims may be the most difficult problem for any study of disaster. In some cases, it may be necessary to elicit the cooperation of several government agencies in order to obtain objective information about affected areas. Many agencies may be unwilling to provide names of victims because of confidentiality. Also, potential subjects may be reluctant to participate in interviews because they are involved in litigation. If so, it may be advisable to directly contact the lawyers who are representing the victims and explain the project, thereby obtaining their assistance in eliciting subjects' cooperation.

It should be noted that subject recruitment must be with great sensitivity, as some proportion of subjects will have had very traumatizing experiences and the researcher must not increase this distress. Subjects may be reluctant to share their experience because it is painful, increasing recruitment difficulties. Thus, clinical input into the subject recruitment

process, as well as the interview process, is useful. Also, since the investigator is on the subject's turf in a field study, s/he must gain an appreciation of local norms and customs, and incorporate these into the research design.

Attrition. Longitudinal studies inevitably bring attrition, the loss of subjects due to respondent death, disinterest, illness or physical incapacity, or migration. There is mounting evidence (e.g., Norris, 1987) that attrition is generally overrated as threat to the validity of panel studies. However, attrition may be critical in instances when it occurs as a result of the event under study. For example, in most epidemiological studies, death is not a source of bias since the panel continues to be representative of the surviving cohort. However, if that death is linked to the disaster, either directly or indirectly, it is a cause for concern. Even in this case, deaths would have to occur with considerable frequency to produce a sizable bias. Migration is more problematic because it is not presently known whether those who leave a disaster-stricken area are the "best-off", i.e., those with the assets that allow them to leave, or the "worst-off", those who perceive themselves as least able to cope. The solution here may be to study migration as an important outcome of disaster in its own right.

Of course, investigators should assess who drops out (and why) in any study involving multiple waves of data collection and, when necessary, should use that information to qualify their findings. Applicants for funds should demonstrate knowledge of the issues and should be able to describe procedures that will be used to minimize attrition. Expectations should be realistic, however. The only way to avoid attrition is to not do longitudinal studies, or to begin with a sample of volunteers selected because they will agree, in

advance, to participate in a given number of interviews. The latter approach is obviously unsound, since self-selection on this criterion may introduce a different and undetectable kind of bias.

Recommendations

In many ways, obtaining support for research on disaster and traumatic stress is no different than for any other area. However, several issues are of particular importance for this field of research. Some of these have already been addressed: the nature of traumatic events makes them difficult to study, and both those planning research and those evaluating their proposals must be acquainted with the inevitable problems and tradeoffs.

Several additional recommendations were made by the panel. The panel felt that it was important for a proposal to frame its objectives and predictions in theoretically meaningful terms. Grants proposing to study the effects of disasters have the potential for adding to our understanding of a broad range of issues of critical importance to mental health and prevention (e.g., stress, family disruption, social and economic factors). However, the degree to which this potential is recognizable to evaluators may depend on the extent to which study goals are grounded in relevant theory, so that it is clear that the proposed research will add to the scholarly literature of which disaster is portrayed as a subset. Information from review committee members suggests that many disaster proposals focus on the disaster event itself rather than theoretical underpinnings of the research or broader links to other areas or outcomes. Integrating the methods and theories of other fields within the study of these events may serve to broaden a particular study's significance, and render its strengths more readily recognizable. This suggests the need for greater emphasis on the underlying issue being studied. Thus, if variables

thought to differentiate response to different disasters are psychological processes such as appraisal of stressors, uncertainty, loss, or fear, these processes should be most prominent. This emphasis increases the significance of a study by adding or highlighting information about basic processes that may be applicable to other areas.

Another issue pertains to pre-disaster data. Evaluators of proposals need to keep in mind that it is usually difficult, if not impossible, to get pre-disaster baseline data. In most cases the disaster simply occurs, and the researcher must then design a study as rapidly as possible, in order to insure timely data collection.

In some cases advance preparation can be made possible through advance funding. Review committees may be reluctant to approve an application that proposes to study events that have not yet occurred, and need to be made aware that NIMH regards funding in advance of a disaster to be an appropriate and feasible research strategy in many instances. This is particularly the case for studies which have as their focus a particular mental health research question rather than a particular emergency event, and which require immediate post-impact assessment as an essential element in the study design. Both evaluators and funders of disaster studies need to be aware that although the exact location and timing of a particular disaster cannot be predicted, the overall occurrence of emergency events is regular and frequent. Funding prior to the event allows investigators the opportunity to prepare in advance for such events by developing relevant instruments, devising sampling plans, training interviewers and pilot testing the instruments in areas of high risk.

While most researchers can relate to the inherent problems in this kind of research, as proposal evaluators they may be uncomfortable with challenges to

design validity or to requests for funding that rely on unpredictable events. Rather than avoid these issues in preparing a research application, however, the applicant should specifically address these issues, informing reviewers about pre-measure or control group problems, discussing the merits of various alternatives, and indicating how conclusions will be affected by these problems. Ultimately, the applicant should be able to argue that even with these problems, valuable information will result from the investigations.

Lastly, it was also felt that NIMH should clarify its handling of these proposals so that some consistency can be generated in the review process. Currently, proposals about disaster or traumatic stress are sent to one of several review committees on the basis of some subset of issues in the proposal. Ideally, proposals should be sent to a narrower range of committees. If this could be accomplished, one or more experts in the area of stress or trauma or disaster could be appointed as voting members of the committee(s) reviewing these proposals, thereby providing "in-house" expertise.

References

- Asarnow, R.F., & MacCrimmon, D.J. (1978). Residual performance deficit in clinically remitted schizophrenics: A marker of schizophrenia. Journal of Abnormal Psychology, 87, 597-608.
- Baum, A., Gatchel, R.J., & Schaeffer, M.A. (1983). Emotional, behavioral and physiological effects of chronic stress at Three Mile Island. Journal of Consulting and Clinical Psychology, 51, 565-572.
- Baum, A., Grunberg, N.E., & Singer, J.E. (1982). The use of psychological and neuroendocrinological measurements in the study of stress. Health Psychology, 1(3), 217-236.
- Beck, A.T. (1967). Depression: Clinical, experimental, and theoretical aspects. New York: Hoeber.
- Blanchard, E.B., Kolb, L.C., Pallmeyer, T.P., & Gerardi, R.J. (1982). The development of a psychophysiological assessment procedure for post-traumatic stress disorder in Vietnam veterans. Psychiatric Quarterly, 54, 220-229.
- Bolin, R. (1985). Disaster characteristics and psychosocial impacts. In B.J. Sowder (ed.), Disasters and mental health: Selected contemporary perspectives, 3-28. Rockville, MD: U.S. Department of Health and Human Services.
- Bromet, E.J. (1980). Three Mile Island: Mental Health Findings. Pittsburgh, PA: University of Pittsburgh, Western Psychiatric Institute and Clinic.
- Bromet, E.J., & Schulberg, H.C. (1986). The TMI disaster: A search for high risk groups. In Shore, J.H. (Ed.): Disaster Stress Studies: New Methods

and Findings. Washington, DC, American Psychiatric Press, 1986.

Davidson & Baum 1985

- Derogatis, L.R. (1977). The SCL-90 Manual 1. Scoring, administration and procedures for the SCL-90. Baltimore, Johns Hopkins University School of Medicine, Clinical Psychometrics Unit.
- Endler, N.S., & Magnusson, D. (1976). Toward an interactional psychology of personality. Psychological Bulletin, 83(5) 956-974.
- Keane, T.M., Caddell, J.M., & Taylor, K.L. (1988). Mississippi scale for combat-related posttraumatic stress disorder: Three studies in reliability and validity. Journal of Consulting and Clinical Psychology, 56, 85-90.
- Horowitz, M.J., Wilner, N., & Alvarez, W. (1979). Impact of events scale. A measure of psychosomatic stress. Psychosomatic Medicine, 41, 209-218.
- Keane, T.M., & Fairbank, J.A. (1983). Survey analysis of combat related stress disorders in Vietnam veterans. American Journal of Psychiatry, 140, 345-350.
- Keane, T.M., Malloy, P.F., & Fairbank, J.A. (1984). Empirical development of an MMPI subscale for the assessment of combat-related posttraumatic stress disorder. Journal of Consulting and Clinical Psychology, 52, 888-891.
- Lazarus, R.S. (1966). Psychological stress and the coping process. New York: McGraw-Hill.
- Malloy, P.F., Fairbank, J.A., & Keane, T.M. (1983). Validation of a multimethod assessment of post-traumatic stress disorders in Vietnam veterans. Journal of Consulting & Clinical Psychology, 51, 488-494.
- Mason, J.W., Giller, E.L. Kosten, T.R., & Harkness, L. (In Press). Elevation of urinary norepinephrine/cortisol ratio in post-traumatic stress

disorder. Journal of Nervous and Mental Disorders.

Moos, R.H., Moos, B.S. (1986). Family Environment Manual: second edition.

Palo Alto, Calif: Consulting Psychologists Press.

Norris, F.H. (1987). Effects of attrition on relationships between variables

in surveys of older adults. Journal of Gerontology, 42(6), 597-605.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for

research in the general population. Applied Psychological Measurement,

1(3), 385-401.

Rey, A. (1964). L'examen clinique en psychologie. Paris: Presses

Universitaires de France.

Robins, L.N. & Smith, E.M. (1983). Diagnostic Interview Schedule/Disaster

Supplement. St. Louis: Washington University School of Medicine,

Department of Psychiatry.

Rosvold, H.E., Mirsky, A.F., Sarason, I., Bransome, E.D., & Beck, L.H. (1956).

A continuous performance test of brain damage. Journal of Consulting

Psychology, 20, 343-350.

Smith, E.M., Robins, L.N., Pryzbeck, T.R., Goldring, E., & Solomon, S.D.

(1986). Psychosocial consequences of a disaster. In J. Shore (Ed.),

Disaster stress studies: New methods and findings. Washington DC,

American Psychiatric Press.

Spielberger, C.D., Gorsuch, R.L., & Lushene, R.E. (1970). Manual for the

State-Trait Anxiety Inventory (self-evaluation questionnaire). Palo Alto:

Consulting Psychological Press.

Spitzer, R.L., & Williams, J.B. (1985) Structures clinical interview for DSM-III-R, patient version. New York: Biometrics Research Department, New York State Psychiatric Institute.

Stroop, J.R. (1935). Studies of interference in serial verbal reactions. Journal of Experimental Psychology, 18, 643-662.

Zung, W. (1965). A self-rating depression scale. Archives of General Psychiatry, 12, 63-70.

Workshop Participants

Andrew Baum, Ph.D.
Department of Medical Psychology
USUHS
4301 Jones Bridge Road
Bethesda, MD 20814

Leonard Bickman, Ph.D.
Program Evaluation Laboratory
Box 59, Peabody College
Vanderbilt University
Nashville, TN 37203

Edward B. Blanchard, Ph.D.
Department of Psychology
State University of New York
Albany, NY

Laura M. Davidson, Ph.D.
Department of Medical Psychology
USUHS
4301 Jones Bridge Road
Bethesda, MD 20814

Bonnie Green, Ph.D.
Traumatic Stress Study Center
Department of Psychiatry
University of Cincinnati
Cincinnati, OH 45267

Suzanne Hadley, Ph.D.
NIMH, Extramural Policy Branch
5600 Fishers Lane
Room 9-95
Rockville, MD 20857

Harry C. Holloway, M.D.
Department of Psychiatry
USUHS
4301 Jones Bridge Road
Bethesda, MD 20814

Terence Keane, Ph.D.
Veterans Administration
Medical Center
Psychology Service (116B)
150 South Huntington Avenue
Boston, MA 02130

Robert Laufer, Ph.D.
Department of Sociology
Brooklyn College of CUNY
Brooklyn, NY 11210

Jack Maser, Ph.D.
NIMH, Mood, Anxiety, and Personality Disorders Research Branch
5600 Fishers Lane, Room 10C-23
Rockville, MD 20857

Fran Norris, Ph.D.
University of Louisville
Urban Studies Center
Louisville, KY 40292

Darrel A. Regier, M.D., M.P.H.
NIMH, Division of Clinical Research
5600 Fishers Lane, Room 10-105
Rockville, MD 20857

John Reid, Ph.D.
Oregon Social Learning Center
207 East Fifth Avenue
Eugene, OR 97401

Elizabeth Smith, Ph.D.
Washington University - St. Louis
Department of Psychiatry
Barnes and Renard Hospitals
4940 Audubon Avenue
St. Louis, MO 63110

Susan D. Solomon, Ph.D.
NIMH, Emergency/Disaster Research Program
5600 Fishers Lane, Room 10C-05
Rockville, MD 20857

02079 OH100

COMMUNITY HEALTH CELL
326, V Main, 1 Block
Koramangala
Bangalore-560034

Peter Steinglass, M.D.
George Washington University
Center for Family Research
Ross Hall, Room 613
2300 Eye Street, NW
Washington, DC 20037

Robert Ursano, M.D.
Department of Psychiatry
USUHS
4301 Jones Bridge Road
Bethesda, MD 20814

Primary Prevention in Aircraft Disasters

Integrating Research and Practice

Carolyn L. Williams
Susan D. Solomon
Paul Bartone

University of Minnesota
National Institute of Mental Health
Walter Reed Army Institute of Research

ABSTRACT: *The integration of rigorous scientific research with program development and implementation is essential in new areas of psychological practice, such as primary prevention for aircraft disaster victims. Research on primary prevention for air disasters can provide practical information on how to help victims cope with traumatic events, as well as contributing to theoretical understanding about the role of trauma in the development of psychopathology. Both epidemiological research on the mental health effects of disasters and practitioner experiences are used in this article to identify high risk groups and types of primary prevention interventions for air disasters. Practical suggestions are provided for research in this area, including discussions of design issues, access to victims, selection of instruments, and issues involved in obtaining funding. Implications of media attention and litigation also are considered.*

Until recently, primary prevention for aircraft disasters has focused on accident reduction, with little attention given to the emotional sequelae confronting those closely involved with the disaster. Prevention efforts of the airline industry and government authorities emphasize improvements in engineering, structural design of the aircraft, and escape procedures (Frederick, 1981). The crash investigations and hearings of the National Transportation Safety Board (NTSB) exemplify this approach. After crashes involving American carriers, NTSB investigators painstakingly examine potential causes, in the hope of preventing similar future accidents. These causes usually include weather conditions at the time of the crash, human factors, and mechanical or engineering failures. Preventive changes are implemented when problems are discovered, as in the case of the 1987 crash in California caused by a disgruntled airline employee who shot the crew in flight. Within weeks of this accident, all airline employees were required to pass through airport security checks to prevent their carrying weapons on board. Furthermore, at the request of the Federal Aviation Administration (FAA), airlines are reviewing their termination and grievance policies, again, with prevention in mind.

Psychologists are involved in these accident prevention efforts. Some work on improving instrument panels and other aircraft system designs to enhance human performance. Industrial psychologists work with personnel

departments to develop protocols for exit interviews when airline employees are terminated. Psychologists also are involved in the psychological screening of pilots and other crew applicants to eliminate those with problems that could interfere with the safety of a flight (e.g., alcoholism, drug abuse, psychosis, impulse-control problems, high risk-taking behavior, memory problems). Along with psychiatrists, they evaluate crew members who have participated in treatment for such problems to determine their fitness to return to work.

Air travelers no doubt welcome these efforts to reduce accidents and would not want to see them diminished. However, there is a growing awareness that much more is needed in terms of psychological services and primary prevention for those involved in air disasters. This was recognized at the federal level as early as 1977 when the National Institute of Mental Health (NIMH) began planning a meeting on the topic. The meeting was held in 1978 and was attended by leaders from the airline industry, the NTSB, the FAA, the Flight Attendants Association, the Airline Pilots Association, medical personnel in the airlines, airport personnel, and behavioral scientists (Frederick, 1981). Fortunately, much has changed since that meeting when it was noted that no efforts had been directed to meet the mental health needs of those involved in air disasters.

In this article, we describe primary prevention activities that can be and, in many cases, already have been implemented to alleviate the emotional trauma associated with air disasters. We follow the scientist-practitioner model, guided by research results on mental health and disasters, and emphasize the need for epidemiological evaluation of primary prevention efforts. We begin with a discussion of epidemiological concepts and disaster research, followed by descriptions of high risk groups and types of interventions. We conclude with a consideration of practical research issues and a discussion of the impact of media attention and litigation.

Epidemiological Concepts and Disaster Research

Epidemiology is an eclectic discipline focusing on the distribution of diseases and disorders in the population, with the goal of identifying associated factors that eventually lead to the development and evaluation of preventive interventions and public health practices (Lilienfeld & Lil-

ienfeld, 1980; Williams & Poling, in press). Epidemiology, like primary prevention, differs from clinical research and practice in emphasizing populations rather than individuals. Thus, it is particularly relevant to those requiring information about population needs during a disaster in order to plan community, airline, or airport responses.

Primary prevention of mental disorders has been defined in a number of ways, all of which focus on reducing new cases (i.e., incidence) in a given population. Cowen's (1982) structural requirements for primary prevention help to differentiate it further from more traditional clinical practice: (a) It must be targeted to groups, not individuals; (b) the target groups must not yet experience significant maladjustment (although they can be at risk for problems); and (c) it must be based on theory or research supporting its potential for improving mental health or preventing maladaptation.

Epidemiologic findings from disaster research indicate that there is a significant increase in psychiatric morbidity following major catastrophic events that can linger far beyond the disaster itself (Bromet & Schulberg, 1987). Further research is needed to provide estimates of the likely number of psychiatric casualties following disasters and to explore personal and environmental risk factors associated with disorder. However, it is acknowledged that primary prevention services, like crisis intervention, and possibly longer term psychological care, are needed for disaster victims. Bromet and Schulberg (1987) also suggested that epidemiological techniques can be used to evaluate the effectiveness of different psychological interventions following disasters.

Thus, disaster studies are not only of theoretical significance but are also of great practical importance. For example, not enough is known about what constitutes good adjustment to a traumatic event (Wortman, 1983). It is assumed that certain behaviors such as keeping distress to a minimum, continuing to function and to achieve socially desired goals, and maintaining a positive attitude are signs of effective initial coping. However, Wortman (1983) cited research suggesting that these factors are not always associated with the best long-term adjustment. Silver and Wortman (1980) noted the need for normative information on how people react to similarly stressful events after varying lengths of time to assess whether an individual is coping "normally."

At present, little is known about the relationship between short- and long-term responses to traumatic events (Bromet & Schulberg, 1987; Mangelsdorff, 1985). Repeated, long-term measurement is needed to determine which aspects of the event and/or personal characteristics lead to chronic disorder and to ascertain whether early patterns of symptomatology predict chronic manifestations of maladjustment. Recent studies (e.g., Bartone, Ursano, Ingraham, & Wright, in press; McFarlane, 1988a, 1988b) are beginning to provide answers to some of these questions.

The kind of epidemiological research most directly relevant to primary prevention is the experimental intervention study used to establish the efficacy of particular

prevention interventions for disaster victims (Bromet & Schulberg, 1987). The need for this kind of research is great, because few of the recently developed intervention techniques for disaster victims have been subjected to systematic assessments of effectiveness. Much also remains to be learned about how a good prevention intervention, once identified, can be successfully implemented. Suchman (1969) noted that a program can be unsuccessful for two reasons: Either the intervention is a poor one (a failure of theory), or the intervention is effective but has not been successfully implemented (a failure of program). Therefore, two kinds of research are needed: *outcome* evaluations that assess the impact of the prevention intervention and *process* evaluations that assess its implementation (cf. Weiss, 1972). Process research can be used to describe how the program was implemented, to identify the types of disaster victims that were helped, and to isolate the components of the crisis intervention process that were cost effective (Frederick, 1981).

It also should be recognized that the effects of primary prevention interventions may not always be positive. Research should be designed to identify unanticipated negative program outcomes as well as favorable results. Further, the research effort itself may be associated with harmful side effects. For example, investigators must consider carefully the potential impact of their interview questions. By their very nature, disaster studies are designed to explore mental health responses to a traumatic event. Although many victims will find that these interviews lead to an emotional catharsis (McFarlane, 1988a), others may find it troubling to answer questions about their experience. Although the stressful aspects of such interviews can be minimized (cf. Solomon, in press), research should be undertaken only when the potential utility of the study results is high.

High Risk Groups

Survivors of the crash. Understandably, the attention of health care workers usually is focused on the most immediate or primary victims of a disaster—those who survive the crash. This also has been noted in other disasters, as in the classic studies of Lindemann (1944) following the Coconut Grove nightclub fire and Lifton (1967) after the World War II Hiroshima bombing. The initial concern for survivors is preservation of life. Traumatic wounds, burns, bleeding, and shock frequently must be treated by emergency medical personnel, but crash victims also are at risk for psychological injury. Although individual di-

The opinions expressed herein are those of the authors and do not necessarily reflect the official positions of the National Institute of Mental Health, or of the Department of the Army, or the Department of Defense (para 4-3, AR 360-5).

The authors gratefully acknowledge the editorial comments of Mary Alice Schumacher of the Division of Epidemiology, University of Minnesota.

Correspondence concerning this article should be addressed to Carolyn L. Williams, Division of Epidemiology, School of Public Health, Stadium Gate 27, 611 Beacon St. S.E., Minneapolis, MN 55455.

ferences in response to disaster trauma are not well understood, it is clear that most disaster victims show some signs of disturbance, and some proportion develop more serious and persistent psychological disorders (Leivesley, 1984; Mangelsdorff, 1985). Those who are exposed to air disasters may be especially vulnerable because of the sudden and violent nature of the event. Manifestations of anxiety, depression, anger, hysteria, and guilt are commonly observed (Frederick, 1981; Johnson, 1984).

Bereaved families and friends of victims. Another highly visible group of persons in need of services is the bereaved and upset families and friends of the dead and injured. Initial death notifications often are made by telephone, as anxious relatives call seeking information about their loved ones. Families and friends may present themselves at the accident scene, seeking information and displaying a variety of stress or grief reactions.

A rather extensive literature now exists on grief and bereavement (e.g., Glick, Weiss, & Parkes, 1974; Osterweis, Solomon, & Green, 1984). There is evidence that sudden, unanticipated death is more acutely stressful and disruptive than death that is expected (Glick et al., 1974). The very suddenness of air disaster deaths thus increases the risk of psychological injury for the families and close friends of victims. Timing is sometimes cruel, as when an air disaster occurs during a holiday season and expectations of joyful reunions are destroyed in seconds. For example, when an Army charter flight crashed near Gander, Newfoundland, just before Christmas 1985, killing all 256 on board, families received the bad news in a large hall where they had assembled for a welcome-home holiday celebration. The room was filled with colorful banners, holiday decorations, and excited children. The awful report came in sharp contrast to hopeful personal anticipations and the festive physical surroundings. This seemed to contribute to a sense of shock and disbelief that persisted for months in the case of some friends and relatives (Wright, 1987).

Disaster workers. A number of recent studies document the psychological costs of major disaster work on first responders such as fire fighters and police officers (e.g., Durham, McCammon, & Allison, 1985; Keating, Blumenfield, Reilly, Pine, & Mittler, 1987; McFarlane, 1988a, 1988b; McFarlane & Raphael, 1984), as well as on body handlers and morgue workers (e.g., Jones, 1985; Taylor, 1984; Taylor & Frazer, 1982). The exposure to the gruesome sights, smells, and sounds involved in such disaster situations can leave lasting disturbing impressions. This is exacerbated when workers see themselves as similar to the victims and form a personal identification with them (Jones, 1985; Ursano et al., 1988). The risk is increased when workers continue to work long beyond their normal endurance limits, a common phenomenon. In this context, it is noteworthy that air disasters often result in badly mutilated and fragmented bodies scattered over a wide area, making recovery difficult. In the Gander crash, only three of 256 bodies were intact enough to be viewed by relatives, and many body parts were never found at all (Maloney, 1987). Such circumstances prolong

the body recovery and identification operations for workers, increasing their exposure to traumatic stimuli.

The job of immediate responders is complicated further by coordination and control problems. Under ordinary circumstances, fire and police departments function independently. They generally are not well prepared for coordinated activities. Areas of responsibility frequently overlap, and lines of authority become blurred. Disaster situations call for many decisions to be made quickly. With multiple agency involvement, it often is not clear who is in charge. The same problem can occur among different departments of one agency when they are not experienced at working together. This can mean increased confusion and stress for immediate response workers at the disaster site, as well as for responsible officials and leaders.

Coordinators and leaders. Those in leadership positions sometimes suffer the most. They can be exposed to the same stressors as the workers and also have the burden of coordinating activities, making critical decisions, and monitoring the condition of their personnel. In some cases, the leaders may have had responsibilities before the crash that provoke them to feel guilty about its occurrence. Leaders especially are prone to work without rest in disaster situations, often beyond the point of effectiveness (Wright, 1987). Also, as we describe in the intervention section, although debriefing sessions and other primary prevention programs are becoming more common for disaster workers, their leaders, including police and fire chiefs, airline executive officers, and military base commanders, frequently exclude themselves from these sessions to allow the workers more freedom to express their emotions.

Key leaders of organizations, often with limited emotional assistance from others, serve as their "principal mourners, orchestrators of solemn ceremony, and symbols that life must go on" (Wright, 1987, p. 26). They can facilitate the community's mourning through "grief leadership," a process described by Wright and her colleagues. The key leaders at Ft. Campbell after the Gander crash included the brigade commander, the battalion executive officer, the division/post commander, and the president, who is commander in chief. These individuals frequently expressed their own sadness and grief and stressed the importance of not being alone during the initial notification and subsequent public ceremonies. Airline executives often serve in a similar role as the representatives of the company's grief in public memorial services and through personal messages to airline employees, as well as to any survivors and victims' families.

Individuals providing emotional assistance to victims and the bereaved. In the past, both researchers and practitioners tended to ignore disaster workers whose primary role was to comfort and assist the bereaved. However, recent studies suggest that such helpers are very much at risk for psychological distress. Increased role confusion and feelings of depression and helplessness were reported in workers whose function was to provide emotional support to bereaved families in the aftermath of the Granville

Primary Prevention Interventions

Disaster Planning and Drills

Just as research and practice in past disasters indicate individuals at risk, they also provide evidence about particularly noxious aspects of disaster work that can be targeted for primary prevention efforts (e.g., Hartsough & Garaventa-Myers, 1985; Mangelsdorff, 1985; National Institute of Mental Health [NIMH], 1985). Some of the problems (e.g., role ambiguity, lack of coordination) can be addressed through effective predisaster planning and practice drills, as is mentioned elsewhere in this Public Forum by Anderson (pp. 721–723) and Butcher and Hatcher (pp. 724–729). Anderson describes the FAA requirements for airport disaster plans, but their lack of attention to psychological issues and limited definition of crash victims (i.e., only those on the aircraft) are noteworthy. Airport disaster plans should address the psychological difficulties likely to face workers and families as well. Adequate rest periods for both workers and leaders, along with monitoring of their distress levels during the crisis period, are important. On-site mental health consultations would help meet these needs.

The issue of body recovery and handling has been relatively neglected in some plans, despite evidence of the emotional trauma associated with this aspect of disaster work. Eyewitnesses frequently report being most disturbed by images of “macho” fire fighters and police officers leaving crash sites weeping and distraught. Commercial crashes often involve bodies and parts of bodies of infants, young children, and women, which appear to be particularly troubling to view. Most disaster plans optimistically deal with survivors, yet the most difficult disasters have few or no survivors, leaving the fire fighters, police officers, and emergency medical personnel emotionally unprepared for their work.

Medical examiners can play a vital role in helping to reduce the trauma of disaster work by being sensitive to the needs of other workers. It is essential to involve them in predisaster planning in order to avoid problems noted in some recent crashes, including exposing airline personnel and other untrained individuals to indescribable carnage in temporary morgues. As an example, one airline middle manager asked to use a telephone near a temporary morgue and was sent through the morgue to an area filled with pieces of bodies, without any consideration that this might have a negative effect on her. Only essential personnel should be exposed to those experiences. If untrained personnel are needed to assist in the body cleanup, they should be told what they are likely to see and experience and should feel free to refuse the assignment without penalty. The Army recognized the importance of this during the charter crash, using only volunteers for body handling.

As noted above, some airlines assign employees, often managers from sales or personnel departments, to assist victims or their families and friends during the crisis period. Their mandate varies across companies, but it

(Australia) train disaster of 1977 (Raphael, Singh, Bradbury, & Lambert, 1983–84). Similarly, after the 1983 Ash Wednesday bushfires in Australia, Berah, Jones, and Valent (1984) found that intense and intimate involvement between helpers and victims was related to increased muscle tension, fatigue, and sleep disturbances, especially for the workers providing emotional support and counseling. In a study of rescue workers in the 1985 Dallas–Ft. Worth crash, Keating, Blumenfield, Reilly, Pine, and Mittler (1987) found that those who worked primarily with families of victims displayed more symptoms than any other group considered. After the Army’s crash, both the chaplains providing emotional support at the home base (Wright, 1987) and the Army officers assigned to provide assistance to the bereaved family members (Bartone, 1987; Bartone et al., in press) had fairly significant emotional reactions and symptoms. Raphael (1986) has summarized work in this area, suggesting there are three primary sources of stress for disaster helpers: (a) the close encounter with death, reminding helpers of their own vulnerability, (b) the sharing of the anguish of victims and their families, which often results in a close empathic identification, and (c) role ambiguity and role conflict.

Risks to mental health professionals are not often considered following disasters. However, these helping professionals are exposed to extraordinary suffering during disaster work, even though they may be better prepared than other workers providing emotional support. Both mental health practitioners and researchers have noted difficulties in such work. For example, Berah et al. (1984) found that members of a mental health team who responded to the Ash Wednesday bushfires of 1983 showed a variety of emotional and physical symptoms four weeks after the intervention ended. Disaster researchers also have observed that they are not immune to the psychological risks associated with exposure to disaster victims (e.g., Ingraham, 1986; Keating, 1987).

Airport and airline personnel. Some of these individuals are included in the previous categories, as it is inevitable that airline and airport personnel can be survivors of a crash, members of bereaved families, or friends of victims or can be involved in the disaster cleanup, notification of families, and provision of assistance to victims and families. Grief is felt intensely throughout a company after a crash and even across companies because of the camaraderie within the industry, such that, for example, flight attendants will send large funeral flower sprays to the offices of another company’s flight attendants as an expression of condolence after a crash. Grief within an airline or other organization can be complicated by preexisting conditions such as poor morale or job dissatisfaction that may intensify common reactions of guilt, anger, and hostility. Concerns about safety and fear of flying also may increase. Some individuals may be at greater risk, including any who fit into the previous categories; those who witnessed the crash or saw the crash site; those with any contact with deceased passengers, crew members, or the lost air craft; and flight crew members.

often similar to "help in any way possible," which leads to considerable role ambiguity, a major source of stress described in the previous section. Airlines frequently fly families to the site of the crash, and airline personnel may become involved in the body identification process, arranging funerals, and providing emotional assistance to grieving families. This has been done without attention to selection issues (other than to use employees with "people-handling" skills, hence the sales and personnel managers), without training, and sometimes without mental health consultation as backup.

In general, this assignment of airline employees to assist families is commendable and gives the families valuable contact persons with access to company resources. Some companies have given needy families help beyond free travel, including paying for funerals and wakes, buying clothing and other personal items, and even providing a missed paycheck. However, an effective plan is necessary to reduce potential negative effects for both families and employees.

Such a plan should include attention to airline employee selection and training and development of guidelines for disaster work, as well as easy access to mental health consultation during the crisis period. Even some of the more obvious selection issues have been ignored in recent crashes (e.g., use of volunteers with an adequate grasp of English and U.S. culture, avoidance of individuals with known mental health problems or recent major life stressors—both negative, such as the suicide of a loved one, or positive, such as marriage within the last 24 hours or the impending birth of a first child). Training may be best addressed through mental health education, described subsequently, and an on-site briefing session with a mental health professional in the event of a crash. Mental health consultation also can be provided through a 24-hour crisis hot line.

Mental Health Education

Health education provides people with information about health-related practices and behaviors, with the hope that they will use the information to promote health. Health education can be targeted either directly to crash victims and families or to service providers and other disaster workers to improve their ability to help victims and families and to reduce the negative impact of the experience on their own lives. It usually is a low-cost intervention, and fortunately, a number of relevant materials are already available, many from the Emergency Services Branch of NIMH.¹ A new booklet on bereavement, based on a monograph for professionals (Osterweis et al., 1984), may be useful for grieving family members (Institute of Medicine, in press). Two pamphlets have been prepared for direct distribution to disaster relief workers and their

supervisors, including front line responders such as fire, police, and emergency medical personnel (NIMH, 1987b, 1987c). Other materials available from NIMH are training manuals for emergency medical personnel and human service workers who must deal with the emotional problems of both adult and child victims (Farberow, 1978; Farberow & Gordon, 1981; Lystad, 1985; NIMH, 1987a) and a monograph on aircraft disasters (Frederick, 1981). Still other materials provide descriptions of preventive interventions aimed at emergency workers themselves (Hartsough & Garaventa-Myers, 1985; NIMH, 1985). A final resource is Johnson's (1984) book for passengers on airplane safety and survival that includes a chapter on accidents describing common stress reactions and possible coping strategies.

On-Site Mental Health Consultation

Mental health services for aircraft and other disasters should be guided by the principles discovered during World War I for the treatment of "shell shock": "immediacy, proximity, and expectancy" (Mangelsdorff, 1985). Rapid attention to emotional problems, close to where the problems developed, with an expectation of full recovery and return to work led to fewer long-term psychiatric casualties than in victims who were evacuated from the front and treated at home. This suggests that primary prevention services should be provided immediately after the crash at the airport, airline facilities, or other places where victims and families congregate (e.g., hotels or hospitals), with an expectation of a return to normal functioning. Mental health professionals who design services for crash or other disaster victims and wait for victims to appear at the doors of the mental health center not only will find themselves with few "patients," but also will have missed the opportunity for prevention (Wright, 1987). Butcher and Hatcher (this issue, pp. 724–729) provide further descriptions of on-site consultation.

Crisis Hot Line

A useful procedure in an aircraft disaster is to staff a 24-hour crisis hot line, using a toll-free number. Others have noted the unique problems in providing psychological services for aircraft disasters, where victims typically do not know each other and quickly disperse throughout the country (Butcher & Hatcher, this issue; Frederick, 1981). Bereaved relatives, unable to sleep, may choose to be consoled with this anonymous, confidential service. Likewise, affected airline personnel, particularly flight crews, may find themselves alone in foreign hotels and in different time zones from their natural support systems. It may be a particularly useful transition procedure after the funerals when airline personnel typically end their family assistance duties. The phone number can be given as the family assistance workers leave. Furthermore, the telephone hot line can be used by the workers for consultation about how to handle trying emotional issues, to make referrals to professionals in victims' home towns, and as a coordination center for the mental health team.

At least one airline has used such a service, staffed

¹ Individuals interested in obtaining these and other disaster-related NIMH publications are encouraged to contact NIMH's Office of Scientific Affairs, Public Inquiries Branch, Room 15c-05, 5600 Fishers Lane, Rockville, MD 20857. Multiple copies are also available through the U.S. Government Printing Office.

by mental health consultants, during the month following a major crash. The hot line was used by employees across the company, as well as by victims' families. An already established 800 number, originally intended for employee suggestions and input, was used by the mental health team. The team worked out of the airline's offices, rather than a mental health clinic. This made the team highly visible to airline executives and other employees, resulting in many informal in-person consultations, in addition to the telephone service. The high use of the hot line may have been due to its on-site location and other outreach efforts. Process research, described earlier, would be quite useful for evaluating and refining hot line use.

Debriefing Sessions

Mitchell (1983, 1985) developed a program called Critical Incident Stress Debriefing that he and others have used in the aftermath of aircraft disasters. The debriefing is a group process, led by a mental health professional, with the following goals: ventilation of intense emotions; exploration of symbolic meanings; group support; initiation of the grief process in a supportive environment; reduction of the "fallacy of uniqueness"; reassurance about the normalcy of the intense emotions; preparation for the continuation of the grief process in the next few months; warnings about serious emotional, cognitive, and physical symptoms; and encouragement of group support and/or professional assistance (Mitchell, 1985). Because of the intensity of the sessions, experienced professionals are suggested as leaders, rather than peer facilitators. Although there is debate about whether participation in debriefings should be voluntary or mandatory, required sessions have been suggested to reduce the stigma associated with receiving psychological services (NIMH, 1987a, 1987b).

Practitioner experience indicates that disaster workers perceive a need for debriefing sessions and believe in their efficacy. Mitchell (1985) reported that 313 (86.9%) of a sample of disaster workers from four states reported psychological or somatic symptoms after a disaster experience and 336 (93.3%) felt that psychological debriefings were necessary and helpful. However, there is a dearth of outcome evaluation research on debriefings, a particular concern given the trend to make them mandatory.

Primary Prevention Research

Designing the Intervention Evaluation

The foregoing discussion describes some of the primary prevention techniques that have been developed to assist victims of disaster. When feasible, the ideal method for evaluating a prevention intervention is the true experiment, in which a complete enumeration is made of a selected subgroup of victims (e.g., workers, families); this list is used later to randomly assign victims to the intervention and control groups. Investigators using this method can assess the extent to which a given technique is successful in reducing or preventing long-term symp-

tomatology or behavior problems, relative to a no-intervention control condition.

Unfortunately, the drawbacks of a true experiment may preclude its use for assessing intervention effectiveness. Practitioners often express strong reservations about withholding (or even delaying) an intervention from individuals in immediate need of assistance. Random assignment into treatment and no treatment conditions is also likely to face opposition from airline management personnel who feel they must provide some sort of assistance to everyone involved. Another potential obstacle to random assignment is presented by the victims themselves, who may refuse to consent to the intervention technique or control group assignment. This kind of self-selection introduces undetectable sources and amounts of bias, thereby preventing estimation of intervention effects. Some of these practical difficulties can be removed by eliminating the no-intervention control group and designing the study as a comparison of two competing techniques. Given the current state of knowledge about prevention interventions for disaster victims, true experiments may be readily justified when performed in this way, because it has not yet been established which, if any, of the existing intervention strategies is effective in preventing stress-related disorders.

In some cases, a quasi-experimental approach, which combines elements of both descriptive epidemiology and the true experiment, will be the optimal research strategy. For example, an investigator can use epidemiologic survey methods to identify victims at highest risk for psychopathology, either in terms of the severity of their disaster experiences (e.g., injury, bereavement, contact with the dead or injured) or in terms of initial levels of psychological disturbance. A variety of active outreach strategies can then be directed toward these high-risk victims (e.g., company newsletters, on-site service provision at either the airport or hotel where families or victims are housed; cf. Lindy, Grace, & Green, 1981). Individuals reached by these different methods can be referred to the primary prevention study investigators, who then randomly assign victims to either the intervention or the comparison group (e.g., an intensive day-long debriefing session compared to provision of a short leave and mental health education materials). When the number of victims is small, between-group differences can be minimized by matching victim according to levels of impairment and/or exposure, prior to random assignment. This research strategy allows for many levels of assessment within a single project: risk factor assessment, assessment of outreach efficacy (process evaluation), and assessment of the effectiveness of the prevention intervention (outcome evaluation). With this project structure, the effects of predispositional factors, disaster experiences, and the interventions themselves can be distinguished readily, because the problems of confounding typically encountered in purely descriptive intervention studies have been eliminated. Further, the design permits comparisons of the long-term outcomes of high-risk victims who receive debriefing with those of "untreated" comparison group victims also identified a

high risk by the initial descriptive study. If individuals in the comparison victim group are still displaying high levels of distress at the long-term follow-up assessment, they can be debriefed as well, providing the study has succeeded in demonstrating the effectiveness of the debriefing session.

Obtaining Access to Victims

The foregoing discussion suggests the range of individuals who may be considered victims of a given air crash. Although any of these groups may be selected as the target of primary prevention efforts, gaining both immediate and long-term access to these victim populations can be the greatest practical problem encountered by any disaster investigator. As described earlier, passengers on a flight are often far from home, and they typically come from disparate regions of the country. Thus, surviving passengers and family members are likely to disperse quickly after such accidents, complicating efforts to evaluate the long-term consequences of a primary prevention intervention. Although disaster workers and airline and airport personnel may present less of a logistical problem, like other victims, they probably cannot be directly approached by the investigator. Typically, it is necessary for investigators to work through the affected airline, airport, or the disaster relief agency to identify the different kinds of disaster victims and enlist their cooperation in an intervention study. Wortman, Abbey, Holland, Silver, and Janoff-Bulman (1980) offered excellent practical advice on establishing a sound relationship with agencies that work with victimized populations, advice that also applies to working with airlines and airports.

Success of the project depends not only on the cooperation of the airline, airport, or victim assistance organization, but also on the victims themselves. The purpose and importance of the project should be explained to respondents in sufficient detail so that they understand the potential benefits of the study both to society and to themselves (e.g., the possibility of improving intervention techniques of subsequent benefit to the victim, the opportunity to talk to a sympathetic listener). If victims initially decline to participate, the interviewer should find out why, because many may be willing to be contacted at a later date. Investigators must be sensitive to victims' problems and needs and avoid the use of coercive enlistment procedures. Initial contact should be postponed until acute distress has subsided and victims are able to make a reasoned choice about study participation (Wortman et al., 1980). However, early assessment may reasonably be built into the intervention itself. For example, a psychological assessment procedure may be administered at the beginning of a debriefing session scheduled for relief workers who have finished their disaster work.

Selecting the Instrument

In the interests of both validity and cross-study comparability, standardized diagnostic instruments should be employed to assess responses to the air disaster and the mental health prevention intervention. Selection of a

specific instrument will, of course, depend on the objectives of a particular study. Some of the more commonly employed measures include the Impact of Events Scale (Horowitz, Wilner, & Alvarez, 1979), a measure designed to assess recently experienced posttraumatic stress symptoms of avoidance and intrusion, in relation to a stressful life event. Another frequently employed self-report measure is the Symptom Checklist (SCL-90; Derogatis, 1977); this measure requires respondents to report recent symptoms associated with nine psychiatric diagnoses.

A different approach to outcome assessment focuses on diagnosis rather than symptomatology, as exemplified by the Diagnostic Interview Schedule/Disaster Supplement (DIS/DS). This instrument assesses both the emergency experience and rates of specific Diagnostic and Statistical Manual of Mental Disorders (DSM-III; American Psychiatric Association, 1980) diagnoses selected for their potential relevance to the disaster experience (e.g., posttraumatic stress disorder, generalized anxiety disorder, depression, somatization, alcohol abuse disorder; Robins & Smith, 1983; Solomon, in press). The DIS/DS is a structured survey instrument designed to be administered by lay interviewers. Other standardized instruments for assessing rates of psychiatric diagnoses use open ended, in-depth interviews and are intended for use by expert clinicians, such as the Schedule for Affective Disorders and Schizophrenia (SADS-L; Endicott & Spitzer, 1978). However, the in-depth interview is likely to result in at least a temporary, semitherapeutic involvement of the diagnostician with the victim, so that even the "no-treatment" control group may be receiving a brief intervention not characteristically experienced by the untreated victim population.

At present, there is considerable controversy over the choice of a pathology measure for identifying vulnerable populations. Some favor an index of symptomatology level alone, whereas others would require victims to meet diagnostic criteria for psychiatric disorder for purposes of crisis intervention. Because Bromet and Schulberg (1987) have found that the symptom scales and diagnostic schedules measure different dimensions of psychopathology, they suggested that the choice of instrument will depend on whether those implementing a disaster intervention program choose to focus on primary or secondary prevention. They recommend that studies of primary prevention interventions use symptom scales such as the SCL-90, given their ability to detect victims whose initial high distress level is likely to persist. Even though not all of these individuals will develop full-blown psychiatric disorders, severe emotional distress in itself justifies intervention to prevent possible subsequent physical illness or behavioral dysfunction.

In addition to self-report measures, behavioral, psychophysiological, and neuroendocrinological measures also have been used to measure stress, and some researchers advocate a multilevel, "whole body" approach to the study of responses to stressful events (cf. Baum, Grunberg, & Singer, 1982). One way to supplement self-report data is to use proxy measures of functioning, such

as records maintained by schools, employers, and medical facilities. Attaining access to such records enables longitudinal assessments of, for example, school performance, work attendance, systolic blood pressure, number of prescriptions, and numbers of visits to physicians and/or mental health professionals. Inferences about intervention effects can be made by comparing these factors before and after disaster exposure, for both the intervention and comparison victim groups.

Obtaining Funding

In practice, initial assessment is likely to take place later in the disaster-response process than is scientifically desirable, given practical constraints such as funding delays. For example, NIMH has a nine-month grant review cycle, from time of submission to earliest possible award. The time involved in preparing a detailed application, as well as addressing requests for revisions by peer reviewers, can add substantially to this nine-month time frame. Although the length of the review process may be appropriate for other study topics, it effectively eliminates the possibility of funding studies that require the assessment of early responses to particular disaster events. In general, NIMH grant applicants are encouraged to focus their research on a given mental health issue rather than on a particular emergency event, a focus that permits review, approval, and funding prior to the disaster. Research planned in advance of a particular air disaster may meet the needs of the industry as well, for airlines and airports can be inundated with research proposals immediately after a crash, at a time when they are least prepared to handle the requests. NIMH also contributes to the National Science Foundation's grant to the University of Colorado for a rapid response program designed to cover nominal data collection and travel expenses for investigators desiring immediate access to a disaster site. Although the program does not cover salaries, it provides the investigator with early entry into the field, thereby allowing time to prepare a full-blown research application. Still needed, however, is a funding process that expedites review of this overall project application.

Final Notes

Experienced professionals will recognize immediately two issues that have not been discussed so far, but that loom over any efforts at primary prevention for aircraft disasters: media attention and future litigation (Butcher & Dunn, in press). Aircraft disasters are newsworthy events, and insensitivity on the part of some reporters can interfere with victims' coping responses or with primary prevention interventions and research. For example, negative press stories about an airline's motivation to provide assistance to victims' families can increase the hostility and suspicion of the families, as well as the guilt, frustration, and helplessness of the airline personnel working with families. There are numerous examples of microphones thrust in front of sobbing faces or of television cameras blocking mourners' views of funeral services to obtain 20 seconds of film for the evening news. At the same time,

the news media often are willing to provide health education materials to the public about effective coping strategies. It would be most useful if a cooperative arrangement could be made with media representatives, perhaps as a component of a disaster plan (NIMH, 1978).

Litigation is the other major issue that must be considered either in planning and delivering services or in research. Frederick (1981) suggested that the potential for costly claims of emotional injury may lead insurance companies to provide financial incentives for preaccident training for airline employees or for other primary prevention programs to reduce the number of long-term disorders among disaster victims. On the other hand, some victims may see the primary prevention practitioner as an ally or someone who can testify about the extent of their suffering in future claims. Potential litigation also has other deleterious effects on primary prevention interventions and research. Survivors and families frequently are overwhelmed by individuals seeking to represent them in potentially lucrative settlement cases. In fact, after several recent crashes, an individual calling himself "Father Irish" posed as a Catholic priest, gained access to areas where grieving families awaited news of their relatives' fate, and tried to sign them with an attorney. Needless to say, families will be justifiably suspicious of offers of help under these circumstances and may refuse to participate in the interventions or research. There also have been reports of insurance companies attempting to get negative, personal information about a victim's private relationships in order to reduce the settlement. In fairness to some airlines, it also is important to note that their executives arranged in advance with the insurance carrier that no information obtained by airline personnel assigned to help families or given to mental health consultants hired by the company would be used in the settlement cases. These issues of confidentiality must be considered in advance.

Finally, because of litigation issues and media attention, it is unlikely that *individual* airlines will pursue needed research on the effectiveness of their interventions. Like others involved in crises, these companies will want to return to normal functioning after the crisis period (usually four to six weeks), and no matter how open they were initially to mental health services and research, individual companies probably will see no advantage in participating in long-term follow-up studies. It is not advantageous for an airline to be seen as wanting to prepare for its next crash. Who wants to be a passenger or employee on a carrier that believes it will crash again? Furthermore, what if its intervention proves iatrogenic? The careful reader already will have noted that no individual airlines have been named in this article. Although some have sought and used extensive mental health consultation after a crash, companies prefer confidentiality and anonymity about primary prevention activities after the disaster period. This desire for confidentiality by individual companies, completely understandable from a business standpoint, suggests that an industry-wide approach is necessary to further the significant progress already made

in this area, because as recent events indicate, air disasters do occur and their victims do need help. Furthermore, research on primary prevention intervention for air disasters may provide information useful in other disasters as well, increasing the benefits of studies in this area.

REFERENCES

- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: Author.
- Anderson, T. (1988). An airport director's perspective on disaster planning and mental health needs. *American Psychologist*, 43, 721-723.
- Bartone, P. (1987, October). *Boundary crossers: The role of Army survivor assistance officers in the Gander disaster*. Paper presented at the Biennial Conference of the Inter-University Seminar on Armed Forces and Society, Chicago.
- Bartone, P., Ursano, R. J., Ingraham, L. H., & Wright, K. (in press). The impact of a military air disaster on the health of assistance workers: A prospective study. *Journal of Nervous and Mental Disease*.
- Baum, A., Grunberg, N. E., & Singer, J. E. (1982). The use of psychological neuroendocrinological measurements in the study of stress. *Health Psychology*, 1, 217-236.
- Berach, E. F., Jones, H. J., & Valent, P. (1984). The experience of a mental health team involved in the early phase of a disaster. *Australian and New Zealand Journal of Psychiatry*, 18, 354-358.
- Bromet, E. J., & Schulberg, H. C. (1987). Epidemiologic findings from disaster research. In R. E. Hales & A. J. Frances (Eds.), *American Psychiatric Association Annual Review* (Vol. 6, pp. 676-689). Washington, DC: American Psychiatric Press.
- Butcher, J. N., & Dunn, L. A. (in press). Human responses and treatment needs in airline disasters. In R. Gist & B. Lubin (Eds.), *Psychosocial aspects of disaster*. New York: Wiley.
- Butcher, J. N., & Hatcher, C. (1988). The neglected entity in air disaster planning: Psychological services. *American Psychologist*, 43, 724-729.
- Cowen, E. L. (1982). Primary prevention research: Barriers, needs and opportunities. *Journal of Primary Prevention*, 2, 131-137.
- Derogatis, L. (1977). *The SCL-90 Manual I: Scoring, administration and procedures for the SCL-90*. Baltimore, MD: Johns Hopkins School of Medicine, Clinical Psychometrics Unit.
- Durham, W. T., McCammon, S. L., & Allison, E. J. (1985). The psychological impact of disaster on rescue personnel. *Annals of Emergency Medicine*, 14, 664-668.
- Endicott, J., & Spitzer, R. (1978). A diagnostic interview: The Schedule for Affective Disorders and Schizophrenia. *Archives of General Psychiatry*, 33, 766-771.
- Farberow, N. L. (1978). *Training manual for human service workers in major disasters* (DHHS Publication No. ADM 86-538). Washington, DC: U.S. Government Printing Office.
- Farberow, N. L., & Gordon, N. (1981). *Manual for child health workers in major disasters* (DHHS Publication No. ADM 86-1070). Washington, DC: U.S. Government Printing Office.
- Frederick, C. J. (Ed.). (1981). *Aircraft accidents: Emergency mental health problems* (DHHS Publication No. ADM 81-956). Washington, DC: U.S. Government Printing Office.
- Glick, I. O., Weiss, R. S., & Parkes, C. M. (1974). *The first year of bereavement*. New York: Wiley.
- Hartsough, D. M., & Garaventa-Myers, D. G. (1985). *Disaster work and mental health: Prevention and control of stress among workers* (DHHS Publication No. ADM 85-1422). Washington, DC: U.S. Government Printing Office.
- Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of Events Scale: A measure of subjective stress. *Psychosomatic Medicine*, 41, 209-218.
- Ingraham, L. H. (1986). *Lessons learned consequent to the Gander Newfoundland airplane crash: Notes on organizing and conducting a research team in circumstances of crisis, disaster, or tragedy*. Unpublished manuscript, Department of Military Psychiatry, Walter Reed Army Institute of Research, Washington, DC.
- Institute of Medicine. (in press). *Understanding bereavement reactions in adults and children: A booklet for lay people* (DHHS Publication No. ADM 88-1555). Washington, DC: U.S. Government Printing Office.
- Johnson, D. A. (1984). *Just in case: A passenger's guide to airplane safety and survival*. New York: Plenum.
- Jones, D. (1985). Secondary disaster victims: The emotional effects of recovering and identifying human remains. *American Journal of Psychiatry*, 142, 303-307.
- Keating, J. P. (1987, August). *An overview of research on human response during disasters: Major fires, earthquakes, tornadoes, and airplane accidents since 1980*. Paper presented at the annual meeting of the American Psychological Association, New York.
- Keating, J. P., Blumenfeld, M., Reilly, M., Pine, V., & Mittler, E. (1987, May). *Post-disaster stress in emergency responders*. Paper presented at the annual meeting of the American Psychiatric Association, Chicago.
- Leivesley, S. (1984). Psychological responses to disaster. In J. Seaman (Ed.), *Epidemiology of natural disasters* (pp. 109-139). Basel, Switzerland: Karger.
- Lifton, R. J. (1967). *Death in life: The survivors of Hiroshima*. New York: Random House.
- Lilienfeld, A. M., & Lilienfeld, D. E. (1980). *Foundations of epidemiology* (2nd ed.). New York: Oxford University Press.
- Lindemann, E. (1944). Symptomatology and management of acute grief. *American Journal of Psychiatry*, 101, 141-148.
- Lindy, J. D., Grace, M. C., & Green, B. L. (1981). Survivors: Outreach to a reluctant population. *American Journal in Orthopsychiatry*, 51, 468-478.
- Lystad, M. (1985). *Innovations in mental health services to disaster victims* (DHHS Publication No. ADM 85-1390). Washington, DC: U.S. Government Printing Office.
- Maloney, J. (1987). Body handling at Dover Air Force Base: The Gander disaster. In R. Ursano (Ed.), *Individual and group behavior in toxic and contained environments* (pp. 97-102). Bethesda, MD: Department of Psychiatry, Uniformed Services University of the Health Sciences.
- Mangelsdorff, A. D. (1985). Lessons learned and forgotten: The need for prevention and mental health interventions in disaster preparedness. *Journal of Community Psychology*, 13, 239-257.
- McFarlane, A. C. (1988a). The phenomenology of posttraumatic stress disorders following a natural disaster. *Journal of Nervous and Mental Disease*, 176, 22-29.
- McFarlane, A. C. (1988b). The longitudinal course of posttraumatic morbidity: The range of outcomes and their predictors. *Journal of Nervous and Mental Disease*, 176, 30-39.
- McFarlane, A. C., & Raphael, F. (1984). Ash Wednesday: The effects of a fire. *Australian and New Zealand Journal of Psychiatry*, 18, 341-353.
- Mitchell, J. T. (1983). When disaster strikes . . . The critical incident stress debriefing process. *Journal of Emergency Medical Services*, 8, 36-39.
- Mitchell, J. T. (1985). Healing the helper. In National Institute of Mental Health (Ed.), *Role stressors and supports for emergency workers* (pp. 105-118, DHHS Publication No. ADM 85-1408). Washington, DC: U.S. Government Printing Office.
- National Institute of Mental Health. (1978). *The media in a disaster* (DHEW Publication No. ADM 78-540). Washington, DC: U.S. Government Printing Office.
- National Institute of Mental Health. (1985). *Role stressors and supports for emergency workers* (DHHS Publication No. 85-1408). Washington, DC: U.S. Government Printing Office.
- National Institute of Mental Health. (1987a). *Human problems in major disaster: A training curriculum for emergency medical personnel* (DHHS Publication No. ADM 85-1390). Washington, DC: U.S. Government Printing Office.
- National Institute of Mental Health. (1987b). *Prevention and control of stress among emergency workers: A pamphlet for team managers* (DHHS Publication No. ADM 87-1496). Washington, DC: U.S. Government Printing Office.
- National Institute of Mental Health. (1987c). *Prevention and control of stress among emergency workers: A pamphlet for workers* (DHHS Publication No. ADM 87-1497). Washington, DC: U.S. Government Printing Office.

- Osterweis, M., Solomon, F., & Green, M. (Eds.). (1984). *Bereavement: Reactions, consequences, and care*. Washington, DC: National Academy Press.
- Raphael, B. (1986). *When disaster strikes*. New York: Basic Books.
- Raphael, B., Singh, B., Bradbury, L., & Lambert, F. (1983-84). Who helps the helpers? The effects of a disaster on the rescue workers. *Omega*, 14, 9-20.
- Robins, L. N., & Smith, E. M. (1983). *Diagnostic Interview Schedule/Disaster Supplement*. St. Louis: Washington University School of Medicine, Department of Psychiatry.
- Silver, R., & Wortman, C. B. (1980). Coping with undesirable life events. In J. Garber & M. E. P. Seligman (Eds.), *Human helplessness: Theory and applications* (pp. 279-375). New York: Academic Press.
- Solomon, S. D. (in press). Evaluation and research issues in assessing disaster's effects. In R. Gist & B. Lubin (Eds.), *Psychological aspects of disaster*. New York: Wiley.
- Suchman, E. A. (1969). Evaluating educational programs: A symposium. *Urban Review*, 3(4), 16.
- Taylor, A. J. W. (1984). Architecture and society: Disaster structures and human stress. *Ekistics*, 308, 446-451.
- Taylor, A. J. W., & Frazer, A. G. (1982). The stress of post-disaster body handling and victim identification work. *Journal of Human Stress*, 4-12.
- Ursano, R. J., Ingraham, L. H., Wright, K., Bartone, P., Russell, C., & Cervantes, R. (1988, May). *Psychiatric responses to death and body handling*. Paper presented at the annual meeting of the American Psychiatric Association, Montreal, Canada.
- Weiss, C. H. (1972). *Evaluation research: Methods for assessing program effectiveness*. Englewood Cliffs, NJ: Prentice-Hall.
- Williams, C. L., & Poling, J. (in press). An epidemiological perspective on the anxiety and depressive disorders. In P. C. Kendall & D. Watson (Eds.), *Anxiety and depression: Distinctive and overlapping features*. New York: Academic Press.
- Wortman, C. B. (1983). Coping with victimization: Conclusions and implications for research. *Journal of Social Issues*, 39, 195-22.
- Wortman, C. B., Abbey, A., Holland, A. E., Silver, R. L., & Janoff-Bulman, R. (1980). Transitions from the laboratory to the field: Problems and progress. In L. Bickman (Ed.), *Applied Social Psychology Annual* (Vol. 1, pp. 197-233). Beverly Hills, CA: Sage.
- Wright, K. (Ed.). (1987). *Human response to the Gander military air disaster: A summary report* (Technical Report 88-1). Washington, DC: Department of Military Psychiatry, Walter Reed Army Institute of Research.

Impact of Disaster on Previously Assessed Mental Health

*Lee N. Robins, Ph.D.
Ruth L. Fischbach, Ph.D.
Elizabeth M. Smith, Ph.D.
Linda B. Cottler, M.P.H.
Susan D. Solomon, Ph.D.
Evelyn Goldring, M.A.T.*

Impact of Disaster on Previously Assessed Mental Health

In this chapter we report the results from one portion of a study on the health effects of environmental hazards that was carried out in Missouri during 1983 and 1984. It deals with the experiences of individuals who were interviewed as part of the Epidemiologic Catchment Area (ECA) project. The ECA project estimated the prevalence and incidence of specific psychiatric disorders in the general population. The project was carried out at five sites—New Haven, Baltimore, St. Louis, North Carolina, and Los Angeles—and included about 21,000 respondents, approximately 18,500 of whom were residents in the community and 2,500 of whom were institutionalized. Respondents participated in two in-person interviews that were separated in time by about one year. Also, an additional interview was conducted by telephone with the community sample halfway between the times of the two in-person interviews.

This research was supported by grant no. U01 MH 33883 of the Epidemiological Catchment Area Program, a series of five epidemiologic studies performed by independent research teams in collaboration with staff of the Division of Biometry and Epidemiology of the National Institute of Mental Health; by Research Scientist Award MH 00334; by U.S. Public Health Service Grant MH 14677; and by the MacArthur Foundation Risk Factor Network.

The in-person interviews assessed psychiatric disorders according to criteria in the *Diagnostic and Statistical Manual of Mental Disorders (Third Edition)* (American Psychiatric Association 1980). For the assessment interview we used the Diagnostic Interview Schedule (DIS), written for this purpose by members of the Washington University group (Robins et al. 1981), who were also responsible for the project at the St. Louis site. The DIS is a fully structured precoded interview for which symptom counts and diagnoses are made by a computer. Although the DIS was used at all sites, there were local options that allowed some diagnostic sections to be excluded. The entire DIS was used in the first interview at the St. Louis site. Between the two in-person interviews, questions that covered additional diagnoses were written. The diagnoses of posttraumatic stress disorder and generalized anxiety, which were added to the second in-person St. Louis interview, are of particular interest to the present study.

At the same time that the second wave of in-person interviews was being completed in the St. Louis site, a series of disasters occurred in the more rural areas that were being included in the survey. These disasters included remarkable floods in December, a time of year in which floods are rare. Next, within a few weeks of the floods it was announced that some roads and stables in the area, all contaminated by waste oil containing dioxin sprayed 10 years earlier, were still toxic. Officials also reported that radioactive waste in government-owned quarries had leached into the public water supply, causing some public wells to have levels of radiation that exceeded maximum acceptable standards. In addition to these disasters, a series of tornados occurred in the same general area.

The appearance of these hazards just as this survey of the mental health of the community was being completed offered a remarkable opportunity. It allowed us to return to the respondents who lived in areas affected by the disasters in order to learn whether exposure to floods or tornados or notification of long-standing exposure to dioxin and radioactive water had had an effect on their psychiatric status. We could judge this effect by comparing changes in their mental health status with changes in

the mental health of a control group also previously interviewed. Respondents in the control group lived in similar areas but were thought not to have been directly exposed to the disasters.

Accordingly, we returned to the field with a new interview, the DIS/DS (DS for "Disaster Supplement"), shortly before the first anniversary of the disasters. At the same time we interviewed residents of other nearby disaster areas, including the infamous Times Beach, as well as control respondents for these groups. In this chapter, however, we will discuss only the samples previously assessed as part of the ECA project. (For an assessment of the effects of these environmental hazards on the total sample, see Chapter 3 of this monograph. Chapter 3 also provides a brief chronology of the experiences of residents in the areas that suffered the disasters and a description of the methods used in the current study.) A more complete chronology of the disasters that occurred in Eastern Missouri has been reported by Smith (1984).

Because reports of symptoms prior to the disasters had been collected independently and prospectively from the respondents who had participated in the ECA project, their reports were not subject to possible retrospective bias. It also was the case that the ECA sample came from a more conventional population in terms of marital and job stability than did the new samples and controls from Times Beach and the other exposed areas. The present report therefore offers the opportunity to witness effects of disaster in a stable rural population.

The report on the total disaster sample (Chapter 3) shows that despite efforts to choose control samples from areas with comparable geographic features and similar economic well-being, nonexposed subjects tended to have more stable marriages and, in the postdisaster year, higher incomes. Although some of these differences may have been due to the disaster itself, there is reason to suspect that risk of exposure to these disasters may itself be related to socioeconomic differentials. Lower-income individuals frequently live in areas particularly at risk of floods and tornados. Tornados, for example, typically do more damage to residents of trailer parks than to residents of brick houses; likewise, land along a riverbank that is repeatedly flooded in the spring provides inexpensive homesites. Little is known about whether persons with

preexisting mental disorders have an increased liability to disaster. However, the frequent finding of high rates of mental disorder in low-income groups, a finding replicated in the St. Louis ECA data, suggests that poor mental health might be associated with an increased risk of disaster simply because it is associated with low income.

The fact that the mental health of both exposed and unexposed samples was assessed prior to the disasters allowed us to ask whether exposure to these disasters could have been predicted by the mental health status of the respondents, and to ask whether disaster affects mental health.

IDENTIFYING EXPOSED SAMPLE MEMBERS

To identify ECA sample members likely to have experienced these disasters, we sought the assistance of a variety of governmental agencies, including the Missouri Department of Natural Resources, the Environmental Protection Agency, the Missouri Division of Health, and the Centers for Disease Control. These sources identified areas that had been exposed to the four types of disaster (flood, tornado, dioxin exposure, and radioactive well water) in the counties that constituted our interviewing area. We then labeled respondents as presumed exposed cases if their residence at the time of their second in-person ECA interview was within one of the officially designated areas for floods and tornados, or if any of their recorded addresses since 1972 was in an area said to have been exposed to dioxin or radioactive water. Deciding whether a respondent's home was within the areas designated as exposed by the state agency was not simple because in rural areas homes are on RFD routes, not blocks. However, as well as we could, we located on maps the areas designated as exposed and the residences of respondents and then counted as exposed the respondents whose residences fell within the designated areas.

Out of 743 individuals interviewed in a three-county area made up of rural sections and small towns, we identified 252 ECA respondents whom we believed to have lived in areas exposed to these disasters. We selected all of those respondents at risk according to these calculations plus a control sample of 200 that was

matched for general socioeconomic area. Follow-up interviews were achieved with 84 percent of those designated as at risk and with 81 percent of those designated as controls.

The number of individuals reporting personal exposure when we reinterviewed them in 1983-84 was much lower than expected on the basis of our interpretation of the information given to us by the various public agencies. Only 44 respondents reported personal exposure to one or more of the four disasters, and 8 of the exposed came from the group we had designated as control subjects. Two or 3 of these 8 claimed exposure while working on farmland or at stables at some distance from their homes.

The disaster most commonly experienced was floods. Out of the 24 respondents who reported experiencing flooding, 20 reported exposure to none of the other three hazards. The next most common disaster was exposure to dioxin. Of the 12 respondents exposed to dioxin, 9 reported no other exposure. Twelve individuals had been in a tornado, and 7 of these had experienced no other disaster. Only 4 people reported exposure to radioactive well water, and 2 of these had been exposed to none of the other disasters. Of the 6 respondents reporting multiple exposures, 4 reported exposure to two disasters and 2 claimed exposure to three disasters.

It is not clear why there were so few self-identified cases of exposure. We suspect that many of the radioactive well water users were not aware of their risk. Although news of the contaminated wells appeared in the newspapers, this hazard's newsworthiness was preempted by the excitement over the Times Beach dioxin experience. Many affected persons either may not have known that there were contaminated wells in the area, or they may not have identified these wells as their own water source. Dioxin exposure could also have been unknown, particularly among persons who had since moved from the contaminated areas. However, flood and tornados needed no newspaper stories or letters from state agencies to create notification.

Inasmuch as the dioxin had been sprayed on the roads and stable yards 10 years earlier, and the wells had been radioactive for an unknown period, perhaps for years, it was only the recognition of exposure to these substances that could be expected to have led

Table 1. Demographic Characteristics Before Exposure

Characteristic	Respondents	
	% exposed	% not exposed
Sex and age		
Males		
<25	41	45
25-44	2	5
45-64	20	23
65+	14	11
Females	5	5
<25	59	55
25-44	14	6
45-64	18	27
65+	14	13
	14	5
Socioeconomic status		
High school graduate	63	74
Income 24,000+	37	47
Less	27	27
Nongraduate	37	26
Income 24,000+	10	8
Less	27	18

Note. For sex and age characteristic, exposed, $N = 44$, not exposed, $N = 325$.
For socioeconomic status characteristic, exposed, $N = 41$, not exposed, $N = 299$.

to a change in the level of mental health measured just one year earlier. Biological effects of these substances might already have been present at the time of the initial interviews and, as a result, not detected in a design measuring change over one year. Consequently, we counted as exposed only those who identified themselves as having learned of their exposure since September 1982—the time of the official confirmation of the first of many Missouri dioxin sites and of several potentially hazardous wells. This left in the control group some who may in fact have been exposed but did not know it.

Although the number of individuals exposed was smaller than expected, they remained similar to the nonexposed group in sex, age, and socioeconomic status distributions (Table 1).

IDENTIFYING EFFECTS OF EXPOSURE

When reinterviewed, respondents were given the DIS again, that is, for the third time. Just like the previous administrations, this third DIS asked for a lifetime history of symptoms. Questions were added to ascertain whether each positive symptom in the respondent's lifetime had first been experienced since September 1982 and, if it began earlier, whether it had been experienced at all since that date. Because the dating of symptoms may have been influenced by the disaster experience, we accepted any report of symptoms in the two previous interviews as evidence that these symptoms had predated the disasters. We did this even if the respondent had reported in the postdisaster interview that the symptoms had first occurred since the disaster. However, if in the postdisaster interview a respondent reported a symptom for the first time and said it had begun before September 1982, we assumed that was correct, as there should be no bias, as a result of exposure, toward dating a symptom as earlier than the disaster.

In addition to symptom questions, the postdisaster interview also repeated a number of other measures that might be sensitive to changes in mental health. These included seeking medical or other professional care for problems with emotions, nerves, or substance abuse; self-assessment of general health status as fair or poor and limitations on activity as a result of health problems; report of recent problems in getting along with spouse, relatives, and co-workers; dropping out of the work force or breaking up a marriage; feeling a lack of emotional support from others; experiencing adverse life events and being upset by them; and indicators of malaise and distress such as boredom, loneliness, feeling unneeded or unfairly treated, being self-critical of one's level or quality of accomplishment, worrying excessively about money, feeling overwhelmed by life's problems, and losing interest in current events. Each of these topics was discussed only with respect to postdisaster experiences.

In addition to these questions, all repeated from the ECA interview, there was extensive exploration of the disaster experience and its meaning for the respondents.

The postdisaster interview lasted approximately 90 minutes. Diagnostic status before and after the disasters was calculated by computer algorithms. Significance of differences was tested by the chi-square statistic or by Fisher's exact test when any expected value was less than five.

RESULTS

Diagnoses and Their Symptoms

The disorder that one would expect to show most directly the results of exposure to disaster, considering it was designed specifically for this purpose, is posttraumatic stress disorder.

Before the disasters, posttraumatic stress disorder was very rare. Only two positive cases had been found at the pre-disaster interview that reviewed the entire lives of the 365 persons in the current report. At the postdisaster interview, we found only three new cases, one among those exposed to the disasters (2 percent), and two among the nonexposed (1 percent) (Table 2). Thus, these disasters appeared to have produced very few, if any, cases of posttraumatic stress disorder.

Table 2. Posttraumatic Stress and Disaster

Diagnosis and time of occurrence	Exposed		Not exposed	
	N	%	N	%
Posttraumatic stress disorder				
Pre-disaster	44	2.3	324	0.6
Post-disaster	44	4.6	321	0.9
New cases ^a	43	2.3	320	0.9
Three or more posttraumatic stress symptoms				
Pre-disaster	44	11.4	325	4.3
Post-disaster	44	22.7	325	10.2**
New cases ^a	39	18.0	311	7.7*

^a Among persons with no disorder before disaster

* $p < .01$

** $p < .05$

Perhaps of equal interest to whether full-fledged new cases of posttraumatic stress disorder occurred is whether there was a significant increase in its symptoms. Before the disasters occurred, more of those who would later be exposed reported having had three or more posttraumatic stress symptoms, although the difference was not statistically significant. When reinterviewed after the disasters, symptom frequencies had increased substantially among both the exposed and nonexposed, but now the difference between the two groups was statistically significant ($p < .01$). In part, this difference could be explained by the higher rate of symptoms in exposed individuals before they experienced the disasters. However, when we looked only at those who had had fewer than three posttraumatic stress symptoms before the disasters, the number passing the three level was significantly greater in those who had experienced the disasters. Still, it is noteworthy that most of those exposed did not meet even this modest criterion. Only 18 percent of the disaster victims who had had fewer than three symptoms before the disasters had that many afterward.

Disorders, other than posttraumatic stress, that were investigated included phobia, panic, depression, alcohol abuse, drug abuse, somatization disorder, and generalized anxiety. These were selected either because they were relatively common and, therefore, could be expected to provide sufficient cases for comparison, or because they were disorders likely to result from disaster-related stress. It was for the former reason that we included phobia, although we did not expect it to be affected by disaster because most of the phobias noted in the two ECA interviews were reported to have had their onsets in childhood. It was for the latter reason that we included panic disorder and somatization disorder, which, although rare in the ECA sample, had symptoms that might reasonably have been a response to stress. Depression, alcohol disorders, drug abuse, and generalized anxiety were all potential candidates because they were common, because they could have onsets at any age, and because they had each been reported in the literature as responses to stress. (See for example, Gleser et al 1981; Bromet and Dunn 1981; Richard 1974.)

Table 3 shows the prevalence of these disorders before and after the disasters, as well as the proportion of individuals who developed the disorders within the year following the disasters.

After the disasters, the exposed group had a notably higher proportion of affected persons than did the nonexposed group for one disorder only, phobia, and even that was not statistically significant. Furthermore, the higher rate was accounted for by the exposed group's initially high rate prior to the disasters, not by their developing more new cases. Indeed, the number of new disorders was very small in both groups.

It was possible, however, that exposure to disaster might have increased the number of cases with symptoms of these disorders even if there were too few symptoms to meet diagnostic criteria. This possibility is explored in Table 4. In this table, the number of persons reporting any symptoms of these disorders in their pre-disaster interviews is compared with the number of persons reporting symptoms after the disasters. In a few instances it should be noted that the proportions *declined* at the postdisaster interview even though it is not logically possible for there to have been fewer symptoms experienced over the lifetime a year later. However, some respondents failed to mention at the postdisaster interview

Table 3. Psychiatric Disorders and Disaster

Disorder	Before disaster			Total			After disaster			
	% exposed (N = 44)	% not exposed (N = 325)	% not exposed (N = 322)	% exposed (N = 44)	% not exposed (N = 322)	New cases*	Exposed		Not exposed	
							N	%	N	%
Depression	5	9	5	5	10	42	0	292	1	
Alcohol	9	16	9	9	19	40	0	269	4	
Drug	5	6	5	5	7	42	0	297	1	
Phobia	23	10*	32	32	16	34	9	288	6	
Somatization	0	1	0	0	1	44	0	319	0	
Panic	2	3	5	5	4	43	2	308	1	
Generalized anxiety	16	8	7	7	15	37	0	299	9	

* Among persons without disorder before disaster

* $p < .05$

disorder is considered to be in remission if some episode or series of episodes has ever met criteria for the disorder, but no episode, not even one that fails to meet full diagnostic criteria, has occurred within the "present."

Defining the present as the year since the disaster, we looked to see whether experiencing disaster had preserved those disorders evident in the year prior to the disaster or if it had caused a relapse of disorders that were in remission prior to the disaster; that is, disorders in which no symptom or episode was present in the prior year (Table 5).

Because the number of persons with any particular disorder prior to exposure was small, we have combined the disorders in Table 5. The frequency with which disorders present in the year prior to the disasters were preserved is shown in the top row. No effect of exposure to disaster was seen; indeed, there was more preservation of symptoms in the nonexposed, although the number with disorders present shortly before the disasters was very small. The second row shows relapses in persons with a history of disorder but with no symptom or episode in the year before the disorders. Again, no effect was seen.

We concluded, then, that exposure to these disasters neither engendered, preserved, nor caused relapse of the disorders of phobia, panic, alcohol abuse, drug abuse, somatization disorder, depression, or generalized anxiety.

Table 5. Maintenance or Relapse of Disorders Following Disaster

Symptoms ^a	Exposed		Not exposed	
	N	%	N	%
Present in year before; also present afterward	9	22	41	38
Absent in year before; reappeared	6	17	37	16

^a Among persons meeting criteria before disaster for alcohol, phobia, generalized anxiety, panic, or depression.

symptoms they had previously reported. No significant differences were found between exposed and nonexposed persons following the disasters.

The last column in Table 4 deals only with persons who had no symptoms in the predisaster interview. Again, there was no statistically significant increase in the number of persons who had had each symptom as a result of exposure to disasters, although this may have been the result primarily of the small numbers of exposed persons previously free of depressive and somatic symptoms.

Tables 3 and 4 have shown that the disasters did not cause many new disorders or cause persons without symptoms of a disorder to develop them at a rate greater than would be expected in the absence of disasters. However, there remained the possibility that disasters preserved existing disorders or caused relapses in persons who had previously remitted. Most disorders are considered to be in remission if criteria for the disorder have been met at some time in the respondent's life but no symptom has been experienced in the period defined as the "present." An episodic

Table 4. Lifetime Symptoms of Particular Disorders and Disaster

Symptoms of	Predisaster interview		Postdisaster interview				New cases ^a	
			Total					
	% exposed (N = 44)	% not exposed (N = 325)	% exposed (N = 44)	% not exposed (N = 322)	Exposed	Not exposed	N	%
Generalized anxiety	16	9	7	13	37	3	293	11
Panic	7	4	14	8	41	10	308	6
Depression	48	44	55	54	23	39	181	21
Phobia	14	5*	11	8	38	11	302	5
Somatization	52	52	52	53	21	43	153	25
Alcohol	20	25	20	23	35	9	241	6
Drugs	7	7	5	7	41	0	299	2

^a Among persons without disorder before disaster

*p < .05

Use of Mental Health Services

So far our discussion of mental health effects has been limited by the diagnostic rules of DSM-III. A more sensitive measure might be the respondents' own decisions to seek care for problems they perceived as being psychological or related to substance abuse or their doctor's perception that they had some sort of emotional problem. Consequently, we compared persons exposed with those not exposed in terms of their visits to specialty or general health services during which "you and the health professional you saw talked about any problems you had with your emotions or nerves, or any problems with drug abuse or using too much alcohol, even if you think this may not have been the reason for your visit." This limitation was intended to be as broad as possible so that there would be no bias attendant on the willingness to use the mental health specialty sector and, also, so that problems defined as mental health problems by either the patient or the health care professional would be counted.

Table 6 shows a slightly greater use of mental health services by those exposed both in the year before and the year following the disasters, but the differences are not statistically significant in either period. More of those who had not been users in the previous year became users if they were exposed to disaster, but in the increase was not statistically significant. Thus we again saw no significant effects of disaster on mental health.

Physical Health

It is possible that there was no increase in reported psychiatric symptoms or in the number of people seeking care for emotional problems following exposure to these disasters because respondents were misinterpreting their psychiatric symptoms as physical problems. Such a misinterpretation could have been encouraged by the media's warnings that dioxin and radioactive well water had caused physical ailments.

Table 7 shows that this explanation may be correct at least in the case of those exposed than nonexposed to disaster said that

their health at present was only poor or fair (27 percent versus 17 percent, $p < .01$). However, more of those who were exposed had reported only poor or fair health even before exposure (28 percent versus 14 percent $p < .05$). This suggests that the postdisaster state might be only a continuation of predisaster differences. We found, however, that this was not the whole story. The exposed individuals who had been in excellent or good health before the disaster

Table 6. Mental Health Care Since Disaster

Health care received	Exposed		Not exposed	
	N	%	N	%
In the year before disaster	44	7	322	5
Since the disaster	44	9	322	7
Since the disaster if none in the previous year	41	10	305	5

Table 7. Health and Disaster

Health status	% exposed	% not exposed
GHS predisaster*	(N = 44)	(N = 325)
Excellent	27	41
Good	45	45
Fair	23	12
Poor	5	2
GHS postdisaster**	(N = 44)	(N = 322)
Excellent	16	39
Good	57	44
Fair	20	14
Poor	7	3
Decline from excellent or good status*	(N = 32)	(N = 279)
	34	21
Limitations on activity	(N = 44)	(N = 322)
	30	27
New limitations on activity postdisaster*	(N = 34)	(N = 261)
	24	23

Note. GHS = general health status.

* Among persons with no limitations before disaster.

* $p < .05$

** $p < .01$.

showed more decline in status than those not exposed (34 percent versus 21 percent, $p < .05$). On the other hand, no evidence was found that exposure contributed to the continuity of poor health. About half of those in poor or fair health in both groups improved to good or excellent health within a year.

Although there does appear to have been an adverse effect on those initially in good health, this global evaluation of health was taken immediately after a full discussion of the disaster experience, and so it was subject to bias. It was followed by more concrete questions, including whether illness or injuries had limited the respondent's ability to be active, whether health services had been used, and whether specific physical symptoms had been experienced and, if so, when. One would expect greater specificity to reduce the likelihood of bias. And, indeed, no significant differences between exposed and nonexposed respondents were found with respect to any of these concrete evidences for poor health. As can be seen in the lower half of Table 7, there was no significant increase in disability either in the total sample or in those who had suffered no limitation in the year before the disaster.

We also compared frequency of visits to doctors and found no significant increase (data not shown). When we asked about the onset of physical symptoms not reported in the prior interview, among those exposed to hazards there was a significantly greater appearance of only one symptom, chest pain (data not shown). However, because we inquired about 37 symptoms, we expected one to be statistically significant by chance alone. That this proba-

bly was a chance finding is supported by the fact that there was no trend in the exposed individuals toward more new physical symptoms.

Thus, exposure seems to be related to claims of less than excellent health, but we could not find any substantiating evidence that the health of those exposed to the disasters was really affected in terms of limitations on activity, use of services, disability days, an increase in number of symptoms, or an increase in particular symptoms.

Functional Level and Morale

The most objective measures of function available were whether or not the respondents became or remained unemployed in the year following the disaster and whether their marriages broke up. Fewer of the exposed than nonexposed were working at follow-up (48 percent versus 67 percent, $p < .01$) (Table 8). In part this was simply because fewer of them were working shortly before the disasters hit (52 percent versus 64 percent). Nonetheless, as Table 8 shows, the exposed individuals' high unemployment rate following the disaster was not merely a continuation of their high unemployment rate of a year earlier. More of the exposed who had been working at the previous interview were no longer working ($p < .05$), and there was also a nonsignificant trend in

Table 8. Changes in Employment and Exposure to Disaster

	Exposed		Not exposed	
	N	%	N	%
Unemployed before disaster	44	52	325	64
Unemployed after disaster	44	48	321	67*
Change in work status				
Working to not working	23	22	207	7*
Not working to working	21	14	114	20

* $p < .05$

Table 9. Changes in Marital Status and Exposure to Disaster

Marital status	Exposed		Not exposed	
	N	%	N	%
Married before disaster				
N	44		325	
%	77		75	
Married after disaster				
N	44		322	
%	77		73	
Break-up after disaster*				
N	34		243	
%	3		5	

* Among persons married at the time of the disaster

these unemployed at the previous interview toward remaining unemployed

Marital status, in contrast, was largely unaffected by exposure to disaster (Table 9). Most respondents were married at follow-up (77 percent of the exposed and 73 percent of the nonexposed), about the same proportions as had been married the prior year. New divorces or separations in those married the year before had occurred equally among exposed (3 percent) and nonexposed (5 percent) individuals.

More subjective measures of function were covered by questions that asked about difficulties at work, with spouse, and with relatives and friends. The topics covered included enjoyment of these interactions, being upset with these persons, mutual support, and regret over being involved in the relationship. For the work situation, topics also included satisfaction with the quality of one's own work and pride in one's job.

In the month before the last predisaster interview, those who were to be exposed to disasters had had more problems at work (22 percent versus 8 percent, $p < .05$), and tended to have more problems with their spouses (14 percent versus 8 percent), and with their friends and relatives (20 percent versus 13 percent) than those who would not be exposed (Table 10). At follow-up, they still had

Table 10. Interpersonal Functioning and Exposure to Disaster

Problems	Exposed		Not exposed	
	N	%	N	%
At work (if employed)				
Before disaster	23	22	205	8*
After disaster	22	14	216	9
Recent problems if none before	14	7	174	7
Continuation of before	5	40	19	32
With friends/relatives				
Before disaster	44	20	324	13
After disaster	44	16	322	11
Recent problems if none before	35	6	280	9
With spouse (if married)				
Before disaster	35	14	248	8
After disaster	34	9	241	10
Recent problems if none before	30	7	220	8

(%)

somewhat more difficulty than the unexposed at their jobs (14 percent versus 9 percent) and with friends and relatives (16 percent versus 11 percent), although neither was statistically significant. In any case, the exposed respondents' small excess of problems in every case was simply due to their higher initial level of problems. There was no greater development of problems where none existed before for those exposed than there was for those not exposed, nor was there significantly more continuity of preexisting problems.

In addition to interpersonal relationships, we inquired about feelings, during the prior month, of boredom, loneliness, feeling unneeded, feeling unfairly treated, not enjoying leisure time, feeling dissatisfied with one's own performance of household chores, feeling overwhelmed by problems, lacking interest in current events, and worrying about money. These variables might be considered better measures of distress than of the presence of psychiatric disorder. We counted the number of those feelings experienced "a good deal of the time" in the last month in order to create a distress score.

Before the disasters occurred, these negative feelings were already more common among those who would be exposed than among those who would not be exposed ($p < .10$, Table 11). At

Table 11. Distress Score^a

Distress	Before disaster		After disaster	
	% exposed (N = 44)	% not exposed (N = 325)	% exposed (N = 44)	% not exposed (N = 325)
Score				
None	18	32*	20	31
1-4 positive	75	63	68	63
5+ positive	7	5	12	6
Change				
More distressed			23	20
Less distressed			20	18
No Change			57	62

^aCount in last month of frequently bored, lonely, not needed, unfairly treated, did not enjoy leisure, dissatisfied with own work, overwhelmed, uninterested in news events, worried about money.

* $p < .10$

follow-up, the exposed continued to have more of these feelings, although differences were still below statistical significance. The higher postdisaster scores of those exposed could be explained by continuation of their higher predisaster scores. There was no indication that exposure to disaster caused an increase in distress level. Of the exposed, like the nonexposed, increases over one year were balanced by decreases, so there was little net change.

In summary, the only effects we were able to show for exposure to disaster was that it was followed by increases in posttraumatic stress symptoms (although not sufficient to warrant the diagnosis), unemployment, and, perhaps, by slightly more consultation for mental health services. We were not able to show statistically significant effects on other mental disorders or their symptoms, on function of social function or distress, or even on physical symptoms that might have actually been psychiatric.

Having found surprisingly few adverse mental health effects that could be attributed to disasters, we puzzled over why this might be so. One possibility we considered was that by chance the control group had suffered an excess of adverse events of other kinds, which had had as great an impact on them as the disasters had had on the exposed group. Another possibility was that the exposed group had experienced a bountiful atmosphere of support and helpfulness from the people around them in response to their disaster experience that had adequately compensated for their stress. To explore these possibilities, we had information about recent life events and the availability of support from persons in the social network.

Neither of these possibilities was shown to exist in reality. In the six months prior to their predisaster interview, those who were exposed to disasters did not differ significantly from those who would not be exposed in the number of adverse life events experienced. However, in the postdisaster year, exposed individuals suffered, in addition to the disasters themselves, more adverse life events (Table 12). In particular, they more often lost jobs and lost their goods through repossession ($p < .001$), and they also moved or became ill more often (however, the latter problems

Neither of these possibilities was shown to exist in reality. In the six months prior to their predisaster interview, those who were to be exposed to disasters did not differ significantly from those who would not be exposed in the number of adverse life events experienced. However, in the postdisaster year, exposed individuals suffered, in addition to the disasters themselves, more adverse life events (Table 12). In particular, they more often lost jobs and lost their goods through repossession ($p < .001$), and they also moved or became ill more often (however, the latter problems were not statistically significant). There was no event among the eight we explored that was more commonly experienced by the nonexposed respondents. Over all, statistically significantly more of the exposed suffered at least three of these adverse events in the six months prior to their postdisaster interview (30 percent versus 17 percent, $p < .01$). The particular events that accounted for this

Table 12. Life Events and Exposure to Disaster

Life event	Before disaster		After disaster	
	% exposed (N = 44)	% not exposed (N = 325)	% exposed (N = 44)	% not exposed (N = 323)
Possible correlates				
Lost job	14	7	34	13
Severely ill	5	5	23	16
Moved	9	9	21	16
Sued or goods repossessed	2	2	16	4*
Not correlated				
Car broke down	19	23	39	39
Broke up with spouse	7	2	9	8
Robbed	2	6	9	7
Arrested	2	1	2	1
Three or more adverse events	9	6	30	17**
Change				
Loss of job ^a				
Sued or goods repossessed ^b			26	12***
			14	3***

^a Among those who had not lost job previously.

^b Among those who had not been sued or had goods repossessed before disaster.

* $p < .001$.

** $p < .05$.

*** $p < .01$.

that may have been consequences of the disaster. The evidence also reveals that they accomplished this without developing psychiatric disabilities beyond what might have occurred in the absence of these experiences.

CONCLUSIONS

The present study is the first, to our knowledge, to entail a before and after evaluation of mental health as related to the experience of disaster. The results contrast with those of previous studies of effects of floods, exposure to radioactivity, and exposure to chemicals (see, for example, Bromet 1980; Logue et al. 1979, 1981; Bennet 1970, Rangell 1976; Green and Gleser 1983) because we found remarkably little evidence that such experiences cause significant effects on mental health.

We suspect that the lack of agreement with some previous studies lies both in features of the study design and in the relatively mild nature of the disasters experienced. This study had available assessments of the mental health of the respondents, as well as a comparable control group, prior to the former's exposure to the disasters. This predisaster information enabled us to show that the two groups did not differ significantly before the disasters in either demographic characteristics, which might be risk factors for new symptoms and disorders, or in most types of preexisting symptoms and disorders. Studies in which measurements are available only after the disaster sometimes may compare persons exposed with nonexposed control subjects who initially had lower rates of disorder or less vulnerability to disorder. Even in our data, there was a trend in the exposed toward greater predisposition. Before the disasters, they had significantly more phobias and more interpersonal difficulties at work and less often perceived themselves as in excellent health. Although these were the only statistically significant findings, if we look at the 25 indicators of vulnerability and distress used in this study, we find that before the disasters those who would be exposed exceeded those who would not be exposed in 17, tied with them in 5, and had lower levels in only 3.

were not statistically significant). There was no event among the eight we explored that was more commonly experienced by the nonexposed respondents. Over all, statistically significantly more of the exposed suffered at least three of these adverse events in the six months prior to their postdisaster interview (30 percent versus 17 percent, $p < .01$). The particular events that accounted for this excess may well have been the result of disasters keeping victims from work and thus leading to loss of job, which in turn led to loss of their ability to pay bills.

The greater losses suffered by those exposed did not appear to prompt correspondingly greater social support (Table 13). We asked about four types of support: a) having someone available whose advice they could rely on, b) having someone who could be trusted with potentially damaging information, c) having someone who would comfort them, and d) having someone who would stick up for them if they were involved in a disagreement. Most people, whether exposed or not, felt that they had all four types of support in their social networks both before and after the disasters, and there had been no more increase in social support during the year since the disaster for exposed persons than for unexposed persons.

In short, our evidence shows that the exposed survived not only the disasters themselves but also an excess of adverse life events

Table 13. Social Supports and Exposure to Disaster

Question	Before disaster		After disaster	
	% exposed (N = 44)	% not exposed (N = 325)	% exposed (N = 44)	% not exposed (N = 322)
a				
1	61	69	73	69
2	39	29	20	30
3	0	2	7	1
4				
5			77	64
6			9	18
7			14	18

a. Access to persons who can give reliable advice, can be trusted with damaging information, will offer comfort, and will support unquestioningly.

In poststudy-only designs, it is difficult to disentangle true increases in psychopathology from apparent increases that result from the tendency of those exposed to blame the disaster for difficulties that may actually have predated it. This study has shown that such revision of the sequence of events can be minimized, rather than relying only on global assessments of health, specific symptoms and behaviors are inquired about and if efforts are made to date the onset of these specific symptoms carefully. Such specific questions set in a life-history framework reduce the halo effect that may arise from the respondent's feeling that the disaster should have caused adverse effects.

The fact that the current study found little evidence that these disasters caused the onset of mental disorders, caused remitted disorders to relapse, preserved symptoms of disorders, or caused new symptoms other than those specific to posttraumatic stress disorder may in part be explained by the relative mildness of the disasters encountered by this sample. None of our respondents suffered serious injury, almost all were able to return to their homes after the emergency ended, and none of their relatives died. Although the floods were much more severe than usual and occurred at an unusual time of year, many of those affected had lived for years in areas where some flooding was anticipated in the spring, and many of them had previously been through milder floods. Notification of exposure to dioxin or radioactive well water was in fact only a potential disaster, because there was incomplete and inconclusive knowledge at time of interview as to whether serious diseases found to occur in animals following exposure would actually occur in humans. In addition, those individuals who thought they had been exposed did not know how much, if any, of these dangerous substances they had actually absorbed. In a companion chapter (Chapter 3), we find that subjects with more severe experiences showed an expectedly greater effect. Thus, this report should not be generalized to mean that either natural or technological disaster has no effect on mental health. Nor should it trivialize the experiences of these flood and tornado victims, most of whom reported considerable upset and many of whom lost important possessions, lost jobs, and suffered serious financial problems.

Another possibility that needs to be considered in explaining these largely negative findings, in addition to the relatively mild level of the disasters, is that some of the disasters' effects were shared by both the exposed respondents and our control subjects. Both groups had relatives and friends who were involved in the disasters, and the freedom of movement of both was restricted because the major roads and bridges used by both groups were impassable during the floods. (Support for this possibility is discussed in Bolin 1985.) Further, if dioxin or radioactive well water has an effect on mental health on a biological basis, rather than as a result of recognition of the risks of exposure, there could have been a substantial number of persons in our control group who had been exposed but were unaware of that fact. The much higher rates of exposure anticipated than found suggests that such hidden cases may have been common.

As a result of two findings, however, we doubt that either missed exposed cases among the controls or the disaster-related stresses they shared with the exposed group could explain these results. First, neither those believed exposed nor those believed not exposed showed an increase in psychiatric disorder during the year following the disasters, despite the stresses that their relatives and friends were exposed to and regardless of their own inconvenience during the floods. Second, despite the fact that some of the rural residents had been exposed to dioxin and radioactive well water for up to 10 years, the sample living in the counties in which the disasters occurred tended to have lower rather than higher rates of mental illness compared with the remainder of the St. Louis sample (Robins et al. 1984). Neither of these arguments is definitive because there may be countervailing factors that explain the stability and relatively low level of the rural respondents' rates of disorder. They do, however, suggest that the disaster experience was not a major contributor to the psychiatric status of exposed individuals.

Despite all these caveats, it still may seem surprising that there was no significant increase in cases of posttraumatic stress disorder (PTSD), a diagnostic category designed for such experiences. The lack of new cases may stem from the stringent criteria for this disorder contained in DSM-III. This is a disorder new to the official

psychiatric nomenclature, and there had been no empirical study of it at the time it was included in DSM-III. Among the required symptoms is "numbing of responsiveness to or reduced involvement with the external world." We found few disaster victims with this symptom. Indeed, they tended to seek out relatives and friends for comfort and help. Similarly Lopez-Ibor et al. (1985) found no full-blown cases of posttraumatic stress in patients who were part of a sudden rapidly spreading and catastrophic epidemic in Spain, although most of them suffered insomnia, depression, anxiety, and irritability. The PTSD symptoms they lacked were hyperalertness, guilt about surviving, and reexperiencing the stress. (Our findings and those of others have been taken into consideration in redesigning the criteria for this disorder in the revision of DSM-III currently underway. As a result the absence of numbing will no longer be sufficient to rule out the diagnosis.)

We conclude then that disasters of the level experienced in the winter of 1982 and spring of 1983 by residents of St. Charles, Warren, and Lincoln counties, given the provision of supports available to those affected, had little impact on mental health. The more serious results appear to have been economic. There was substantial job loss and loss of property, with corresponding loss of income and assets. The impressive finding is that people can tolerate severe upset, temporary dislocation, and financial reverses without showing profound effects on mental health. Our efforts to show that their good mental health outcomes could be explained by their avoidance of other adverse life events or the alluring round of friends and supporters failed. The explanation of our findings seems to be that humans are resilient, not that their ability to overcome adverse experience depends on some organisation in another sphere for their adversity.

REFERENCES

American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders. Washington, DC, American Psychiatric Association, 1980

- Bennet G: Bristol floods 1968: controlled survey of effects on health of local community disaster. *Br Med J* 3:454-458, 1970
- Bolin R: Disaster characteristics and psychosocial impacts, in *Disasters and Mental Health: Selected Contemporary Perspectives* (DHHS Publication No. (ADM) 85-1421). Edited by Sowder BJ. Rockville, MD, National Institute of Mental Health, 1985
- Bromet E: Three Mile Island: Mental Health Findings. Pittsburgh, PA, Western Psychiatric Institute and Clinic and the University of Pittsburgh, 1980
- Bromet E, Dunn L: Mental health of mothers nine months after the Three Mile Island accident. *Urban and Social Change Review* 14(2): 12-15, 1981
- Gleser GC, Green BL, Winget C: *Prolonged Psychosocial Effects of Disaster—A Study of Buffalo Creek*. New York: Academic Press, 1981
- Green BL, Gleser F: Stress and long-term psychopathology in survivors of the Buffalo Creek disaster, in *Origins of Psychopathology: Problems in Research and Public Policy*. Edited by Ricks DF, Dohrenwend BS. Cambridge, Cambridge University Press, 1983
- Logue JN, Hansen H, Struening E: Emotional and physical distress following Hurricane Agnes in Wyoming Valley of Pennsylvania. *Public Health Rep* 94(6):495-502, 1979
- Logue JN, Hansen H, Struening E: Some indications of the long-term health effects of a natural disaster. *Public Health Rep* 96:67-79, 1981
- Lopez-Ibor JJ, Soria J, Canas F, et al: Psychopathological aspects of the toxic oil syndrome catastrophe. *Br J Psychiatry* 147:352-635, 1985
- Rangell L: Discussion of the Buffalo Creek disaster: the course of psychic trauma. *Am J Psychiatry* 133(3):313-316, 1976
- Richard WC: Crisis intervention services following natural disaster: the Pennsylvania Recovery Project. *Journal of Community Psychology* 2(3):211-218, 1974

Helzer JE, Helzer JE, Croughan JL, et al: NIMH Diagnostic Interview
Schedule (Version 3). Rockville, MD, National Institute of Mental
Health, 1981

Helzer JE, Helzer JE, Weissman M, et al: Lifetime prevalence of specific
psychiatric disorders in three sites. Arch Gen Psychiatry 41:107-108,
1984

Smith FM. Chronology of disasters in eastern Missouri. Unpublished
report prepared for the National Institute of Mental Health, Contract
No. 83MD525181, 1984

New Methods and Findings, Clinical Insights, The
Monograph Series of the American Psychiatric Press, Inc.,
Washington, D.C., 1986.

Psychosocial Consequences of a Disaster

Elizabeth M. Smith, Ph.D.

Lee N. Robins, Ph.D.

Thomas R. Przybeck, Ph.D.

Evelyn Goldring, M.A.T.

Susan D. Solomon, Ph.D.

Psychosocial Consequences of a Disaster

Beginning in fall 1982 a remarkable set of events occurred to make the St. Louis area the focus of national attention. In October, the Environmental Defense Fund announced 14 confirmed and 41 suspected dioxin sites in Missouri. The majority of these sites were in the St. Louis area. Oil mixed with dioxin had been sprayed in these sites as long as 10 years before and was still present in levels well above those considered safe.

In December, a series of devastating floods swept through the area, causing five deaths, necessitating the evacuation of nearly 25,000 persons from their homes, and resulting in an estimated \$150 million in property damages. Although the evacuation was only temporary for many of the victims, for residents of one flooded community, Times Beach, it proved to be permanent.

The community of Times Beach has subsequently become an

This research was supported by grant no. U01 MH 33883 of the Epidemiological Catchment Area Program, a series of five epidemiologic studies performed by independent research teams in collaboration with staff of the Division of Biometry and Epidemiology of the National Institute of Mental Health, by Research Scientist Award MH 00334, by U.S. Public Health Service Grant MH 14677, and by the MacArthur Foundation Risk Factor Network.

The authors would like to acknowledge the assistance of Linda B. Cortler, MPH, and Ruth L. Fishbein, Ph.D., in conducting this research.

internationally known environmental disaster area comparable to Love Canal and Three Mile Island. It was the first St. Louis area site tested for dioxin (in November 1982). A week later almost the entire town of Times Beach was covered with water as the Meramec River overflowed its banks.

Three weeks after the flood and two days before Christmas, as residents were returning to their homes to clean up and repair the flood damage, a second disaster occurred. The Centers for Disease Control (CDC) issued a health advisory that warned residents to stay out of the town because of high levels of dioxin found in soil samples taken by the Environmental Protection Agency (EPA) prior to the flood.

Residents were scattered over a wide area as they moved into temporary housing. They left behind most of their personal belongings, for what had not been destroyed by the flood was believed to be tainted by dioxin. Because the community had voted to take itself out of the federal flood insurance program, residents had no prospect of reimbursement for damages.

Relocation of Times Beach residents was particularly difficult. They were not well received in their new communities because their new neighbors feared contamination. There was also concern among the former residents themselves about the health effects of the dioxin.

In mid-February the state and federal governments agreed to buy out Times Beach, the first time the federal government had initiated a "buy-out" of an entire community. The buy-out moved slowly and was met with protests by residents who believed the appraisals of their property were too low and that payment was too slow in coming. One year after the disaster, the majority of the residents remained in temporary housing, and only a few had received payment for their property.

Around the same time, a third disaster struck. Some of the wells which supplied drinking water in the area were found to have unacceptable levels of radioactivity, presumably caused by seepage from a uranium plant's waste buried in the 1960s.

The arrival of spring brought more disasters. Flood waters again covered the area, and a series of tornados left a path of destruction.

Coincident with these dramatic occurrences, the areas involved suffered massive layoffs of the work force in many local plants. The unemployment rate in the area rose to a record high of 10.3 percent. A detailed description of these events is provided in *Chronology of Disasters in Eastern Missouri* (Smith 1984).

These disasters occurred just as Washington University was completing interviews for Wave 2 of the Epidemiologic Catchment Area (ECA) project, which was designed to assess the psychiatric status of the region's population (Eaton and Kessler 1985). To our knowledge this was the first time that an area affected by disaster had, by chance, also been the site of a careful evaluation of psychiatric status just before the disaster occurred.

The fact that only some areas of the research site were affected provided another unique advantage—a control group from a similar area, similarly evaluated for psychiatric disorder prior to the disasters. The report of the ECA sample appears in Chapter 2 of this monograph.

Although not included in the ECA project, the community of Times Beach was of particular interest. The severe flooding that occurred in Times Beach followed by the discovery of dioxin and the subsequent evacuation and permanent relocation of its residents provided a unique opportunity to study a double disaster (natural and technological) and the effects of long-term stress on mental and physical health. Essentially all of the residents were similarly affected. They suffered the loss of their homes, their neighborhood, and their community, and they experienced a threat to their health as a result of dioxin exposure.

In contrast to the Times Beach sample, those who were exposed only to dioxin or flooding experienced only temporary relocation. Although the homes of some flood victims were destroyed or badly damaged, they did have the option of returning to the area and repairing or rebuilding (as many chose to do). Similarly, most residents of the other dioxin sites, although faced with uncertainty regarding the hazards of dioxin exposure, could return to their homes after cleanup procedures were completed. Neither of these single disaster groups experienced the total loss of community that the Times Beach group experienced.

THEORETICAL FRAMEWORK

Disaster has been defined as a situation of massive, collective stress (Kinston and Rosser 1974). The psychological consequences of disaster are the result of the combined individual stress reactions and of reactions to change in the social milieu.

Berren et al. (1980) suggested that to understand and predict psychological reactions to disasters one must first recognize the important characteristics that differentiate disasters from one another. They pointed out that the term *victims*, in reality, describes a heterogeneous group that experiences varying consequences as a result of the types and levels of disaster exposure. They proposed a five-factor disaster typology to be used conceptually to distinguish one disaster from another. These factors include the following: type of disaster (natural versus technological), duration, degree of personal impact, potential for recurrence, and control over future impact.

Dioxin exposure, which might be characterized as a "localized environmental disaster," differs from natural disasters in several important ways. First, the threat to be faced is an ongoing condition, discovered only after a prolonged period of investigation. This characteristic clearly differentiates it from more traditional disasters such as floods or tornados where the threat appears suddenly and is immediately obvious to everyone affected by it.

Second, the scope of the problem is uncertain. A localized environmental disaster has no clear geographic boundaries, and there is usually some uncertainty as to how much of a threat it poses. Here again there is a marked contrast with an event such as a flood in which it is quite clear where the water is and what kinds of danger it might pose, although there may be secondary effects like contamination of the water supply.

Finally, exposure to dioxin is pervasive and inescapable. It is pervasive because the inhalation of vapors and contaminated dust thought to be the route of exposure touches everyone in the area, and it is inescapable because the victims become aware of it only after long-term exposure has already occurred.

These features should have important consequences for the

victims. They are faced with an entirely new kind of demand on their abilities and resources—coping with an unnatural event.

Although there is an extensive body of literature on various aspects of disaster, there has been little comparative study of reactions to natural versus technological disasters. We do not know if these two types of disasters produce different types of reactions.

This chapter focuses on two questions: 1) What are the effects of disaster on mental health? and 2) Do different types of disaster produce different levels and types of psychiatric consequences?

SUBJECTS AND METHOD

The study population was drawn from three sources. Four hundred fifty-two subjects were from Mental Health Catchment Area 27, a three-county-mixed small-town-rural area that forms the rural fringe of the St. Louis metropolitan area.

Using government designations of residential areas as exposed or not exposed, all previously interviewed ECA respondents in these three counties who were believed to have been exposed to at least one of the disasters and a random one half of those likely not to have been exposed were selected.

Because of our interest in dioxin exposure and the small number of persons exposed to dioxin in the ECA area, 100 households were selected at random from five confirmed dioxin sites in the St. Louis area. Eighty of these households were drawn from the 800 Times Beach households. An additional 20 households were selected from the approximately 200 households in the four dioxin sites where no flooding had occurred. As none of these households had been included in the ECA project, it was necessary to choose a respondent from each. Kish Tables were used to select one adult respondent from each eligible household (Kish 1965).

A comparison group of 100 cases was randomly selected from households located on a flood plain in Catchment Area 27 thought to be comparable to the dioxin-exposed sample in socioeconomic status. These households had been listed for possible inclusion in the ECA project, but random selection of neighborhoods had left them out of that survey.

Data were collected over an 8-month period beginning in November 1983, approximately 11 months after the onset of the disasters. Field work was conducted by Survey Research Associates, the same interviewers who had conducted interviews for Wave 2 of the ECA project.

A structured interview, the Diagnostic Interview Schedule/Disaster Supplement (DIS/DS; Robins and Smith 1983) was designed for use in this study. It included a modified version of the NIMH Diagnostic Interview Schedule (Robins 1983), selected questions from the ECA interview, as well as disaster-specific questions designed to ascertain the type and severity of the hazards experienced.

The modified DIS/DS permitted us to make the 12 *Diagnostic and Statistical Manual of Mental Disorders (Third Edition)* (DSM-III; American Psychiatric Association 1980) diagnoses shown in Table 1. Diagnoses with low-prevalence rates in the ECA survey (for example, schizophrenia and obsessive-compulsive disorder) were excluded.

Respondents were asked whether they had ever experienced each symptom of the diagnoses covered. Psychiatric symptoms

Table 1. DSM-III Disorders Included in Hazards Study

Disorder and diagnosis
Affective
Major depression, single and recurrent episodes
Dysthymia
Substance use
Tobacco use
Alcohol abuse/dependence
Drug abuse/dependence
Anxiety/Somatic
Phobias
Panic
Somatization
Generalized anxiety
Posttraumatic stress disorder
Anorexia
Personality
Antisocial personality (adult component)

Note. DSM-III = *Diagnostic and Statistical Manual of Mental Disorders (Third Edition)*.

were scored as positive if they met criteria for clinical significance and were not explained entirely by physical illness or substance ingestion. For each positive symptom, onset and recency were obtained. Thus information was available as to the presence or absence of each symptom during the interval between the disaster and the interview, both during the year before the disaster and more than a year before the disaster.

In addition to information about symptoms, respondents were asked about the year since the disasters with respect to their health and disability status and changes in their health status, use of health services and psychoactive drugs, role function, social support, family history of psychiatric disorder, and changes in employment and marital status. The disaster section elicited information on exposure of respondents as well as friends and relatives, personal beliefs regarding the effects of exposure, personal and property losses experienced and the extent of recovery, use of community agencies and evaluation of their helpfulness, the relocation experience, and evidence for symptoms of posttraumatic stress in other members of the household. All respondents were asked to evaluate news coverage of the disaster, whether victims had been stigmatized and on whom they blamed the disaster(s), and whether other stressful life events had occurred in the past year.

The interviews required approximately 90 minutes and were administered in the subjects' homes. A total of 547 individuals were interviewed. The refusal rate was 8 percent for the sample. It was highest (10 percent) among those in the ECA sample who had been interviewed previously.

STATISTICAL ANALYSIS

We first classified our subjects into three groups on the basis of maximum level of exposure: direct, indirect only, and no exposure. Forty percent of the interviewed sample had personally experienced one or more disasters, 24 percent were only indirectly affected through the exposure of relatives or close friends, and 36 percent had no disaster exposure. In order to examine the differential effects of specific types of disasters, we divided the direct

exposure subjects into three groups on the basis of type of exposure (see Table 2). These groups were: flood and dioxin (Times Beach) ($N = 69$), flood only ($N = 75$), and dioxin only ($N = 29$).

Because of their small number, we excluded from our analysis subjects who had experienced only layoffs or exposure to hazardous materials in the work place, or exposure only to radioactive well water, tornados, or various combinations of these disasters.

Chi square and t tests were used to test statistically significant differences between the groups. Differences at the 0.05 level of statistical confidence were considered significant.

Two-tailed tests of significance were used for predisaster comparisons between groups, and one-tailed tests were used to compare the exposure types for postdisaster measurements on the basis of the expectation that the exposed groups would have negative outcomes as a result of their exposure. Respondents with each level of exposure were compared with the other two groups. If the direct exposure group was found to differ, the type of exposure was examined to see whether the difference could be explained by a single type of exposure. Finally, level of exposure was entered into multiple regression along with other determinants of the number of psychiatric symptoms since the disaster and into logistic regression along with other predictors of a positive psychiatric diagnosis to assess its independent contribution to postdisaster psychiatric status.

Table 2 Exposure Categories

Disaster	Exposure	
	Indirect ^a	Direct ^b
Flood	85	75
Dioxin and flood	9	69
Dioxin	12	29
Other	26	21
Industrial exposure/layoff	7	21

Note. Direct = those individuals who personally experienced the disaster;

Indirect = those individuals who were affected by disaster only through the exposure of relatives or close friends.

^a $N = 139$.

^b $N = 215$.

RESULTS

Sociodemographic Characteristics

All of the subjects in our sample were at least 20 years of age, and almost all were white. Fifty-five percent were female, and more than two thirds were married. Two thirds had at least a high

school education, and the median income fell in the \$20,000 to \$30,000 range. The sociodemographic characteristics by exposure level are shown in Table 3.

Subjects in the three exposure levels were similar in terms of sex distributions. However, nonexposed subjects were significantly older than subjects in the other two groups. The youth of the direct exposure group was accounted for by those exposed to dioxin. The flood-only group was not markedly younger than the nonexposed.

Those directly exposed to disaster had less often completed high school, had lower incomes, and were more often separated or divorced than other groups. These differences were consistent across types of disaster for income and education; however, the Times Beach sample (flood and dioxin) had the lowest income and education and the highest proportion of divorced or separated individuals.

Impact of Disaster

Respondents who had been exposed to these disasters directly or indirectly were asked how upset they had been. As might be expected, direct exposure was associated with significantly higher levels of upset than was indirect exposure (Table 4). When asked to recall their feelings at the time the disaster occurred, 68 percent of the disaster victims reported that they had been very upset compared with 17 percent of those who were indirectly affected

Table 3. Sociodemographic Characteristics of Sample

Characteristic	Type of direct exposure				
	Exposure		% flood and dioxin (N = 69)		
	% none (N = 189)	% indirect (N = 139)	% direct (N = 173)	% dioxin (N = 29)	% flood (N = 75)
Age					
20-39	40	57 ^a	50 ^b	43 ^d	72 ^b
40-59	30	27	30	43	21
60+	30	16	20	14	7
Mean	48.8	41.7 ^a	42.5 ^b	42.1 ^b	36.3 ^b
Median	45	38	40	42	34
Sex					
Male	44	42	48	39	52
Marital status ^c					
Married	72	71	66	59	79
Separated/divorced	8	11	18 ^b	28 ^c	10
Widowed	12	7	8	10	0
Single	8	11	8	3	10
Education					
< 12 years	29	29	47 ^c	48 ^c	45
12 years	38	33	34	37	24
> 12 years	33	38	18	15	31
Mean	12.0	12.1	10.9 ^a	10.9 ^a	11.6
Income					
Median	29,453	26,779	20,622 ^b	18,240 ^c	23,481
N	167	127	159	63	27

^a Marital status was dichotomized as separated/divorced versus all other categories for significance tests.

^b Significantly different from none.

^c Significantly different from both none and indirect exposure.

^d Significantly different from dioxin only.

Table 4. Impact of Disaster

Level of upset	Exposure			Type of direct exposure		
	% indirect (N = 139)	% direct (N = 173)		% flood and dioxin (N = 69)	% dioxin (N = 29)	% flood (N = 75)
Very	17	68 ^a		91 ^a	45 ^a	55 ^a
Somewhat	36	21		7	23	24
Not	47	18		2	32	21

^a Significantly higher than indirect exposure.

through exposure of relatives or close friends. Each type of direct exposure contributed to the upset. In addition, the Times Beach group reported higher levels of upset than those who had experienced only dioxin or floods.

In order to determine the consequences of the different types of disasters, subjects were asked to enumerate the personal losses or property damage they had incurred as a result of the disaster experience. A list of 20 items that might have been lost was provided, including house, furniture, clothing, food, car, and heirlooms or mementos as well as less tangible items such as loss of work time, leisure time, or contact with family, friends, or neighbors.

Essentially all of the Times Beach subjects and more than 90 percent of flood-only victims reported significant damage to or loss of property and personal possessions as a result of the disasters (Table 5). Significantly fewer dioxin-only victims had sustained major damage or losses as a result of their exposure to the dioxin. Times Beach victims who suffered losses experienced a significantly greater variety of losses than those who suffered losses from only one of the disasters. They averaged nine types of loss compared with four for dioxin-only and three for flood-only victims.

Table 5. Loss and Recovery From Disaster and Type of Direct Exposure

	% flood and dioxin (N = 69)	% dioxin (N = 29)	% flood (N = 75)	Total % (N = 139)
Loss/recovery				
Loss or damage				
Yes	99 ^a	62	92 ^a	90
M kinds of losses (out of 20), if any	(9 ^{ab})	(4)	(3)	(5)
Disaster caused household a great deal of harm	87 ^{ab}	31	36	55
Recovery level				
Not recovered	31 ^b	24	11	23
Partial recovery	44	53	33	38
Full recovery	25	24	55	38

^a Significantly different from dioxin only exposure.

^b Significantly different from flood only exposure.

Those from Times Beach also experienced more disruption in their living arrangements following the disasters. They had moved an average of three times during the year after the disasters occurred, compared with twice for dioxin-only victims and once for flood-only victims.

At the time of the interview, approximately one year after the disasters had occurred, 55 percent of those who had been directly exposed believed that the disasters had caused them a great deal of harm. Almost all (87 percent) of the Times Beach group believed that the disaster experience had caused them a great deal of harm, as compared with less than one third of each of the two single-disaster groups. Flood-only victims were only slightly more likely than dioxin-only victims to report that the disaster had caused a great deal of harm.

It is interesting to note that one year after the disasters, only one third of the victims reported that they had fully recovered from the disaster experience. Flood-only victims were twice as likely to report full recovery than were those exposed to dioxin with or without accompanying flooding.

Effects on Physical Health

Although few of the victims in the sample incurred injuries as a direct result of the disasters, the stressful nature of the events might be expected to have affected various aspects of their physical health. Self-perceptions of current health status were assessed by asking respondents to rate their current general health as excellent, good, fair, or poor. Responses were dichotomized as good (excellent/good) or poor (fair/poor). Respondents were also asked to compare their current health status to what it was in September 1982, prior to the disasters.

As shown in Table 6, disaster victims were significantly more likely to report their current health as fair or poor compared with those who were indirectly exposed or unaffected by disaster. Thirty percent of those directly exposed rated their health as fair or poor compared with 18 percent of those not directly exposed, a significant difference accounted for by the Times Beach sample.

Table 6. Health Status and Change in Health Status

Health Status	Exposure			Type of direct exposure		
	% none (N = 185)	% indirect (N = 139)	% direct (N = 171)	% flood and dioxin (N = 68)	% dioxin (N = 28)	% flood (N = 75)
Good/excellent	81.6	82.0	69.6	63.2	82.1	70.7
Fair/poor	18.4	18.0	30.4 ^a	36.8 ^a	17.8	29.4
Change for the worse	14.1	15.1	26.3 ^a	27.9 ^a	32.1 ^a	22.7
Among those now fair/poor	41.3 (N = 34)	44.0 (N = 25)	57.7 (N = 52)	52.0 (N = 25)	60.0 (N = 5)	63.6 (N = 22)

^a Significantly greater than no exposure.

^b Significantly greater than indirect exposure.

The poor status of the victims' health appeared plausibly attributable to their exposure. More of them reported a change for the worse in the year since the disaster than did other groups, and those in fair or poor health at interview had more often suffered a recent worsening of their health. All three groups of directly exposed subjects reported higher rates of health decline than the indirect exposure and no exposure groups.

Effects on Mental Health

We turn now to the effects of disaster on mental health. We begin by comparing the experience of psychiatric symptoms since the disaster. If symptoms are more common in victims it is plausible to think that the disaster experience caused mental symptoms. But it will not demonstrate such an effect unless we can also show that the disaster accounts for a greater increase in symptoms than would have been expected in that year.

A significantly higher proportion of the direct exposure group had experienced at least one psychiatric symptom in the year following exposure. And among respondents with symptoms, victims of disaster had experienced significantly more symptoms than those who were not directly exposed (Table 7). No difference

Table 7. Percent Experiencing Any Psychiatric Symptoms and Mean Number of Symptoms During Year After Disaster

Symptoms	Exposure			Type of direct exposure		
	% none (N = 189)	% indirect (N = 139)	% direct (N = 173)	% flood and dioxin (N = 69)	% dioxin (N = 29)	% flood (N = 75)
Percent with symptoms	71	72	87 ^a	90 ^a	83	85 ^a
Mean number of symptoms, if any	3.6	3.3	5.2 ^a	5.9 ^a	5.3 ^a	4.5 ^a

^a Significantly higher than no exposure.

^b Significantly higher than indirect exposure.

was found between the nonexposed and indirectly exposed groups in the experience of psychiatric symptoms during the year after the disasters.

Exposure to all types of disaster showed the same pattern, although the flood and dioxin group had the highest proportion with symptoms and the highest level of symptoms in the past year.

We next looked at the types of psychiatric symptoms that were experienced during the year following the disasters. The proportion of respondents reporting symptoms associated with each of nine psychiatric disorders in the postdisaster year, for each exposure level and type, is shown in Table 8.

Disaster victims showed significantly higher proportions with symptoms of six disorders. They exceeded both the indirect and unexposed groups in symptoms of depression, somatization, phobia, generalized anxiety, and posttraumatic stress disorder; and they had significantly more alcohol symptoms than those not exposed at all. Each type of disaster exposure contributed to the higher rate of these symptoms. Anorexia, drug abuse, and panic disorder showed no increase with exposure.

The indirect exposure group had higher rates of symptoms of every disorder than did the no exposure group, but none of the differences was statistically significant.

Although these results may seem to suggest a powerful effect as a result of direct exposure to disaster, they do not consider whether there are new symptoms or whether those experiencing disasters might have had these symptoms even before the disasters occurred. In order to assess the degree to which the disasters were responsible for producing new symptoms, we therefore determined for each disorder the proportion of respondents reporting a symptom as occurring for the first time since the disaster.

As shown in the lower half of Table 8, differences were much

Table 8. Types of Symptoms Experienced Since Disaster

Symptoms associated with	Exposure		Type of direct exposure	
	% none (N = 185)	% indirect (N = 138)	% flood and dioxin (N = 68)	% flood dioxin (N = 29)
Any symptoms since disaster				
Depression	26.5	33.3	48.3 ^a	58.6 ^{a,b}
Anxiety	6.0	13.0 ^a	19.8 ^a	24.1 ^a
Somatization	31.9	36.2	50.0 ^{a,b}	51.7
Obsessive	16.8	29.0 ^a	24.4	20.7
Phobias	3.2	6.5	12.8 ^{a,b}	13.8 ^a
Drugs	1.6	2.9	2.9	6.9
Generalized anxiety	4.3	8.0	16.3 ^{a,b}	13.8
Panic	0.5	1.4	1.2	6.9
Posttraumatic stress	5.4	11.6	23.2 ^{a,b}	24.1 ^a
Onset of new symptoms since disaster				
Depression	14.1	21.7	23.3 ^a	24.1
Anxiety	3.8	3.6	4.7	6.9
Somatization	7.0	6.5	11.6	27.5
Obsessive	1.6	3.6	1.7	0.0
Phobias	0.5	0.0	1.2	0.0
Drugs	0.0	0.0	0.0	0.0
Generalized anxiety	2.7	4.3	4.7	6.9
Panic	0.0	0.0	0.6	0.0
Posttraumatic stress	2.1	4.3	17.4 ^{a,b}	13.8 ^{a,b}

^a Significantly higher than no exposure.

^b Significantly higher than indirect exposure.

^c Significantly lower than flood and dioxin.

less dramatic. Only two significant differences were found. More of the direct exposure group had new symptoms of depression and posttraumatic stress than did the nonexposure group. The only significant difference from the indirect exposure group was in posttraumatic stress symptoms.

New symptoms might have been a first occurrence of a disorder's symptoms or an increase in preexisting symptoms. To learn which the new depressive and posttraumatic stress symptoms were, we divided each group into those who had had any symptom of each disorder prior to the disasters and those who had not. For the direct exposure group, new symptoms of depression were clearly concentrated among those with preexisting symptoms of the disorder. Of the 102 directly exposed subjects who had symptoms of depression before the disaster, 31.4 percent had new symptoms in the postdisaster period, and only 14.3 percent of the 170 who had had no symptoms prior to the disaster developed depressive symptoms for the first time. In contrast, among the nonexposed and indirectly exposed groups, new symptoms occurred principally among those with no prior depressive symptoms. Indeed, these groups exceeded the direct exposure group in the frequency of a first depressive symptom. Thus, it would appear that the primary effect of direct experience of disasters was to exacerbate preexisting depressions rather than to initiate symptoms of the disorder in those previously symptom free.

For posttraumatic stress there was a strikingly greater increase in symptoms for those with exposure whether or not they had had prior posttraumatic stress symptoms. Their rate of new symptoms was eight times greater than the no exposure group and four times greater than the indirect exposure group, both with and without prior symptoms. Because the proportions reporting symptoms of posttraumatic stress before the disaster were similar (15 to 20 percent in each exposure group) and because flood or dioxin exposure was identified by 70 percent of the directly exposed subjects as the cause of their symptoms, it is reasonable to conclude that the disasters produced new posttraumatic stress symptoms in respondents both with and without previous experience of these symptoms.

Rates of Psychiatric Disorders Following Disaster Exposure

The pattern of distribution of positive diagnoses in the year following the disasters, as expected, followed the distribution of their symptoms. Meeting criteria for recent diagnoses of depression, alcohol, generalized anxiety, phobia, and posttraumatic stress disorder was significantly higher for the directly exposed group than for the other groups (Table 9). The only difference from the patterns found for symptoms was a lack of significant results for somatization disorder because of its rarity in all groups. (Anorexia is omitted because none of these respondents met full criteria.) Prevalences were 4 to 10 times greater in the direct exposure group than in the no exposure group for those disorders.

All three types of direct exposure, as was seen for symptom occurrence, contributed to the higher rates of disorder among the exposed. Although not all differences were statistically significant, it should be noted that all three types of disaster were associated with elevated prevalences of each disorder when compared with the no exposure and indirect exposure groups.

To learn whether exposure to disaster led to the development of new psychiatric disorders, we calculated postdisaster onset rates for each psychiatric disorder. Onset is defined as the accumulation of sufficient symptoms to first meet the criteria for a diagnosis whether or not some symptoms had existed prior to the disasters. The postdisaster incidence rate is the proportion of new cases in the year since the disaster among people who never met criteria for that diagnosis before the disaster.

There were new cases of only four disorders: depression, alcoholism, generalized anxiety, and posttraumatic stress (Table 9). There was a significantly higher incidence of posttraumatic stress disorder among the direct exposure group, but not for other disorders although for all four disorders incidence was highest among the directly exposed.

When the excess of disorders in the directly exposed group could not be attributed to new cases, there remained two other possibilities—exposure to disaster might preserve symptoms of a

preexisting disorder that would otherwise remit, or exposure to disaster might have had no effect at all, and the difference was explained by a higher rate of disorder before the disaster ever happened in the people who were to be its victims. To see which was the case, we first asked whether disaster significantly influenced the persistence of preexisting disorders. We defined a persis-

Table 9. Rates of Diagnosis Since Disaster

Diagnosis	Exposure						Type of direct exposure					
	None			Indirect			Direct			Flood and dioxin		
	%	N	%	%	N	%	%	N	%	%	N	%
Diagnosis present since disaster												
Depression	0.5	185	0.7	138	4.7 ^{ab}	172	5.9 ^a	68	6.9	29	2.7	75
Alcohol	1.6	185	5.1	138	12.2 ^{ab}	172	8.8 ^a	68	10.3 ^a	29	16.0 ^{ab}	75
Somatization	0.0	185	0.0	138	0.6	172	1.5	68	0.0	29	0.0	75
Phobia	3.2	185	6.5	138	12.8 ^{ab}	172	14.7 ^{ab}	68	13.8 ^a	29	10.7 ^a	75
Drugs	0.0	185	0.0	138	2.3	172	2.9	68	3.4	29	1.3	75
Generalized anxiety	4.3	185	8.0	138	16.3 ^{ab}	172	17.6 ^{ab}	68	13.8	29	16.0 ^a	75
Panic	0.0	185	1.4	138	1.2	172	1.5	68	3.4	29	0.0	75
Posttraumatic stress	0.5	185	0.7	138	5.2 ^{ab}	172	5.9 ^{ab}	68	6.9 ^a	29	4.0	75
New cases since disaster (incidence)												
Depression	0.0	180	0.7	134	1.2	163	3.1	64	0.0	27	0.0	72
Alcohol	0.0	170	0.8	121	2.2	137	1.8	55	0.0	22	3.3	60
Generalized anxiety	2.9	172	4.8	124	5.6	143	5.3	54	7.4	27	4.8	62
Posttraumatic stress	0.0	183	0.0	135	3.6	169 ^{ab}	4.5	67 ^{ab}	6.9	29 ^{ab}	1.4	73
Persistence (diagnosis present before and after disaster)												
Depression	25.0	4	0.0	4	66.7	9	50.0	4	100.0	2	66.7	3
Alcohol	20.0	15	29.4	17	54.2	35 ^a	38.5	13	42.9	7	61.7	15 ^a
Phobia	50.0	12	75.0	12	71.0	31	91.7	12	66.7	6	61.5	13
Generalized anxiety	23.1	13	38.5	13	69.0	29 ^a	64.3	14 ^a	100.0	2	69.2	13 ^a

^aSignificantly higher than no exposure.

^bSignificantly higher than indirect exposure.

tent case as one that met diagnostic criteria *before* the disasters and also exhibited some symptoms of that disorder *after* the disaster. We looked at the four disorders that were significantly more prevalent in the directly exposed but had not shown significantly more new cases: depression, alcoholism, phobia, and generalized anxiety.

As seen in the bottom portion of Table 9, the direct exposure group had significantly higher persistence rates than the no exposure group for alcohol and generalized anxiety. Thus, the significantly higher postdisaster prevalence rates of those disorders might be accounted for by the disasters' having preserved their symptoms. Recurrence of depressive episodes in those previously affected was not statistically significantly greater in the exposed, owing to small numbers, but it was substantially higher than in other groups for each type of disaster. For phobia, persistence was not significantly higher in the exposed group than in the unexposed; here, apparently, the much larger number of respondents with a diagnosis prior to the disaster accounted for the significant differences in prevalence.

If exposure to disaster does impair mental health, it is of interest to learn whether its effects are transient or persistent. To learn this, we asked whether psychiatric symptoms were still present in the month just prior to the interview. Table 10 shows that the direct exposure group had a significantly higher proportion of individuals with symptoms in the month before interview than did the unexposed group. The disaster responsible appeared to be flood, with or without dioxin exposure.

Among respondents with symptoms in the month before the interview, disaster victims had more symptoms than did those only indirectly exposed. All three types of exposure contributed to this excess.

These findings might at first suggest that, if anything, symptoms caused by disaster were more persistent than other symptoms. However, the high rate of very recent symptoms in the disaster victims could simply be the result of their having had more symptoms in the last year than other groups, not that they

were particularly long lasting. The bottom section of Table 10 does test the hypothesis that they are persistent.

Among those who had had a symptom in the last year, those exposed to disasters were slightly less likely to have any current symptom than others, and a slightly larger proportion of the symptoms they had experienced in the last year had dissipated more than a month prior to interview. This probably means that their symptoms more often clustered immediately after the disasters and, therefore, had had more time to dissipate before the interview a year later. Thus, their higher rate of symptoms around the time of the interview was explained by the higher numbers of symptoms in the last year among the disaster victims, not by their having especially persistent symptoms.

Table 10. Psychiatric Status One Year After Disaster

Psychiatric status	Exposure			Type of direct exposure		
	None	Indirect	Direct	Flood and dioxin	Dioxin	Flood
% with any symptoms in last month						
N	56	63	73 ^a	80 ^{a,b}	66	71 ^a
M symptoms in last month, if any	189	139	173	69	29	75
N	3.3	2.4	3.7 ^b	3.8 ^b	3.6 ^b	3.5 ^b
% with symptoms in last year, who had any symptoms in the last month						
N	105	87	127	55	19	53
% of all symptoms present in the last year that were present in the last month						
N	79	88	84	88	80	84
	134	100	150	12	24	64
	72	63	59	57	54	65

^a Significantly higher than no exposure.

^b Significantly higher than indirect exposure.

Multivariate Analyses

We found that persons directly exposed to disasters had more psychiatric symptoms and more psychiatric disorders than those not exposed or only indirectly exposed. Their excess of psychiatric symptoms appeared to be due to a proliferation of symptoms similar to symptoms they had already experienced rather than to the development of symptoms of disorders totally new to them. Those indirectly exposed through friends and relatives did not differ from those without exposure.

Although these findings suggest a role for disaster in causing mental disorders, we had also found some initial differences in the exposed group. They were younger, more often separated or divorced, and poorer than those not exposed at all, and they had less education than either the not exposed or indirectly exposed. Given these indicators of a higher risk of psychiatric disorder, it was also likely that they had more psychiatric disorder and more symptoms even before they experienced these disasters. We have already found that they probably at least had had more phobias initially.

To better understand the role of disaster and its interaction with sociodemographic characteristics and prior psychiatric history, we performed three regression analyses. The first sought predictors of the number of new symptoms in the postdisaster year, the second sought predictors of the number of old symptoms still present in the postdisaster year, and the third sought predictors of the presence of any psychiatric diagnosis in the year after the disaster. In each analysis the predictor variables included the following: age, sex, marital status, education (dichotomized as high school diploma or less), the number of psychiatric symptoms with onset prior to the disasters, and the level of disaster exposure (1 = none, 2 = indirect, 3 = flood or dioxin, and 4 = flood and dioxin). Household income was not included as a predictor because pre-disaster income was not available and the significantly lower income of those directly exposed could have been due to the disaster. The results of the regression analyses are summarized in Tables 11-13.

We first performed a stepwise multiple regression to identify which variables warranted inclusion in a more complex model. We found that these variables predicted the number of new postdisaster symptoms very poorly. The only significant predictor was prior symptoms, and it accounted for only 7 percent of the variance (Table 11). The number of old symptoms appearing in the year after the disasters was well predicted, however. The best model used five variables: being unmarried, prior symptoms, greater age, graduating from high school, and exposure to disaster. Together these five variables explained 59 percent of the variance (Table 11). Number of prior symptoms, not surprisingly, accounted for the major share of the prediction (51.5 percent or 87 percent of the prediction achieved). Exposure to disaster was the weakest of these variables, adding only 0.3 percent to the variance explained by the others.

Table 11. Regression Analysis of Predictors of Symptoms in the Year Following Disaster

New symptoms						
Source	df	t	ss	ΔR^2	F	$P <$ R^2
Model	1		1.97		38.87	.0001 .07
Error	493		25.06			
Total	494		27.02			
Variable						
Prior symptoms		27		.07		.0001
Persistent symptoms						
Source	df	t	ss	ΔR^2	F	$P <$ R^2
Model	5		3466.37		130.09	.0001 .58
Error	489		2737.30			
Total	494		590			
Variables						
Married		-.29		.02		.0001
Prior symptoms		.72		.39		.0001
Age		.12		.01		.0001
High school graduate		-.27		.01		.0001
Exposure		.28		.003		.0451

This first stage model was then tested for all possible two-way interactions. Four significant interactions were found: age and education, prior symptoms and education, prior symptoms and disaster exposure, and being married and disaster exposure. Adding these four interactions gave a final model with an explained variance of 63 percent.

In order to understand the nature of the interactions, regressions of the number of persistent symptoms on prior symptoms and on age were performed for the two educational levels, high school graduate and non-high school graduate, and on prior symptoms and married or not married for the four levels of exposure to disaster. Prior symptoms predicted later symptoms for both high school graduates and dropouts, but the relationship was stronger for dropouts. Among high school graduates, younger persons were more likely to have persistent symptoms, whereas among dropouts, older persons were at greater risk. Disaster increased the risk of persistent symptoms for those with both high and low levels of prior symptoms, and for the married and unmarried. However, the effect of disaster was stronger when the predisaster symptom level was high and when the individual was not married.

The very small contribution of disaster to the explanation of the persistence of symptoms in our original stepwise regression seems to have emanated from two sources. Most importantly, the impact of disaster was dwarfed by the importance of the psychiatric history prior to the disaster. The same occurred to some extent for the impact of age, education, and marital status, but disaster's role was particularly decreased because of its high correlation with predisaster level of symptoms ($r = .30$). In addition, its effects were weakened by its interaction with education. As noted in Table 1, those exposed to disaster had less education than the controls. Because education overall was positively associated with the persistence of symptoms, this association with low education tended to mask the impact of disaster. In the final model (Table 12) summing the impact of disaster alone and in interaction with education and prior symptoms, disaster was found to contribute 1.5 percent to the persistence of old symptoms, still a small contribution, but perhaps not a negligible one.

With regard to predicting the presence of any psychiatric diagnosis in the year following the disasters (Table 13), logistic regression found that three variables made a significant contribution: being male, having many symptoms prior to the disasters, and being exposed to disaster. The model explained 31 percent of the variance. No significant interactions were found.

Again, the number of earlier psychiatric symptoms was the strongest predictor of later psychiatric status, and exposure to disaster was the weakest.

Table 12. Explaining the Persistence of Preexisting Symptoms Including Two-Way Interactions

Source	df	t	ss	ΔR^2	F	p <	R ²
Model	9		3691.69		89.94	.0001	.63
Error	485		2211.87				
Total	494		5903.66				
Variables							
Married		.29		.02		.0001	
Prior symptoms		.68		.39		.0001	
Age		.15		.01		.0001	
High school graduate		.12		.01		.0001	
Exposure		.06		.003		.0362	
Interaction							
HS \times Sex		.08		.01		.0004	
HS \times Age		.12		.01		.0001	
Exposure \times Sex		.10		.01		.0005	
Exposure \times Married		.09		.004		.0230	

Note. HS = high school.

Table 13. Stepwise Logistic Regression to Predict Presence of Any Diagnosis in Year Following Disaster

Variable	β	χ^2	p <	Partial R
Sex	-.95	12.53	.0004	-.136
Number of symptoms with onset prior to disaster	.22	77.14	.0001	0.364
Level of exposure	.29	5.75	.0165	0.081

Note. Model χ^2 , 182.00, $p < .0001$. Model R², .31.

DISCUSSION

The results of the present investigation indicate that persons who have survived a disaster have more physical and mental health problems than those who are not exposed or who are only indirectly exposed. However, we found that the apparent impact of disaster is greatly diminished but not entirely removed by taking into account the fact that persons who experience a disaster may have been at higher risk for health problems and psychiatric symptoms even if the disaster had not occurred.

In this study disaster victims differed in several important ways from those who were not exposed. They were younger and poorer, had less education, were more often separated or divorced, and had more psychiatric symptoms prior to the disaster. Initial status and particularly prior psychiatric history overwhelmed disaster exposure in predicting outcome.

The higher rates of psychiatric symptoms and psychiatric disorders found in persons who had experienced disaster seem to be due primarily to a proliferation of symptoms similar to those they had already experienced rather than to the development of symptoms of disorders totally new to them.

There is little evidence that disasters are responsible for the development of new psychiatric disorders or symptoms. The one exception is posttraumatic stress disorder. However, even for this disorder, which was specifically designed for catastrophic events, we found surprisingly low rates of symptoms or diagnoses. Less than 25 percent of disaster victims experienced any posttraumatic stress symptom and only five percent met criteria for a diagnosis during the year after the disasters.

Although the low impact of disaster on mental health might have been due to the relatively mild nature of some of the disasters we studied, it was not the case for the residents of Times Beach. In addition to experiencing severe flooding and dioxin exposure, they were forced to relocate because of the contamination. They had lower incomes, less education, and were more likely to be divorced prior to the disasters and had the highest level of upset, the most loss, and the greatest number of moves afterward. Our results

indicate that they experienced the most severe consequences in terms of physical and mental health. Nonetheless, the majority of Times Beach residents survived the experience without developing psychiatric disabilities. Less than one third had any symptom of posttraumatic stress disorder, and only six percent met criteria for a diagnosis. The incidence rates for any new psychiatric disorder ranged from two to five percent.

Our findings suggest that disaster contributes to the persistence or recurrence of previously existing disorders but is not responsible for the genesis of new psychiatric symptoms or disorders. The low rate of psychiatric morbidity in disaster victims attests to their resilience.

REFERENCES

- American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders* (Third Edition). Washington, DC, American Psychiatric Association, 1980
- Berren MR, Beigel A, Ghermer SA: A typology for the classification of disasters: implications and intervention. *Community Ment Health J* 16(2):103-111, 1980
- Eaton WW, Kessler L (eds): *Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program*. New York, Academic Press, 1985
- Kinston W, Rosser R: Disaster: effects on mental and physical state. *J Psychosom Res* 18(6):437-456, 1974
- Kish L: *Survey Sampling*. New York, Wiley, 1965
- Robins LN: The development and characteristics of the NIMH Diagnostic Interview Schedule, in *Epidemiologic Community Surveys*. Edited by Weissman MM, Myers JM, Ross C. New Brunswick, NJ, Rutgers University Press, 1983

Robins LN, Smith EM. The Diagnostic Interview Schedule/Disaster Supplement St. Louis, MO, Washington University School of Medicine, 1983

Smith EM. Chronology of Disasters in Eastern Missouri. Unpublished report prepared for the National Institute of Mental Health, Contract No. 83MD525181, 1984



